

J. M. Bartlett

Volume X
Number 3

Plastic Products



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Plastic Products

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Plastic Products

VOLUME X



NUMBER 3

U. S. & Company

LAST March the President proposed "a great, voluntary partnership between Government and Business."

This was to be one of the aces of the New Deal, and a great many good things were promised to the junior partner in this closer, friendlier association with his Uncle Samuel. Twelve months have passed.

Any partnership is a willing co-operation, prompted by mutual self-interest and based upon mutual respect and mutual confidence. Upon this basis, the relations of Government and Business during the past year indicate that the junior partner has had a very raw deal.

The partnership proposal came first from the Government and in the form of the N.R.A., which offered that if Business would make important concessions to Labor, it might in return control competition and prices in ways forbidden by the anti-trust laws. Because Business did not welcome partnership with Government, the "may write codes" of the law was arbitrarily revised to the "must write codes" of the President's blanket agreement, and to cap this, the conces-

sions to Labor have been increased while the control over prices has been weakened.

Government shows plainly little respect for Business. Business has no confidence in Government. Such a "partnership" is a mockery. It cannot survive, even as a pleasant oratorical gesture, and this is the time to consider whether any close co-operation between these two is possible, and, if so, desirable.

As a foundation for partnership Government and Business have one common end, national prosperity. Government has other duties and Business, other objectives; but this is their chief, mutual, selfish interest. To promote this end, the two partners have very different talents. The Government must contribute a solid foundation of just law and honest enforcement upon which Business can rear an economic structure that will employ our materials, our capital, and our man power. These important fundamentals are ignored if Business writes laws in their codes, or Government runs fertilizer factories or power plants or air lines.

Shellac vs. Synthetic in Phonograph Records

By John P. Dunne

FROM the earliest days of the phonograph industry records have been produced mainly from compositions using shellac as a binder. Modern synthetic resin production and molding technique is a more recent development.

Gramophone records require practically ideal molding compositions, capable of perfect flow in the mold and with minimum shrinkage on cooling to avoid distortion of the fine record grooves. Indeed, the gramophone record represents the modern acme of molding technique and serves as a test for a molding composition. In ordinary custom molding a variation of 5/1000 inch is permissible, but in phonograph records the precision must be at least fifty times as great.

Shellac records are made from compositions which are basically the same but are varied somewhat by each manufacturer. The formulas are usually closely guarded trade secrets, but the following may be taken as typical:

Shellac 25%; Barytes 35%; Rottenstone 35%; Gum Copal 2%.
A small proportion of silica or other abrasive, of very fine

mesh, also is added to improve the tone of the record and to increase its life.

The components are carefully weighed, then crushed, ground and mixed to a very fine powder, usually of a dark grey color. This powder is then placed in kneading machines, fitted with heavy iron rollers which are heated by means of steam. The kneading operation which is carried on for about ten minutes,

melts the shellac and intimately binds the constituents into a uniform pasty composition. The batch is then removed in the form of a thick sheet onto a metal table where the sheet is folded over and over.

While still warm, the dough is introduced into another machine where it passes between rolls and emerges in the form of "crusts," of predetermined thickness about five feet wide and fifty feet long. The "crust" is marked off into squares, each of which is large enough to make a ten or twelve inch record. After cooling each crust is placed on a long metal table where it is folded at the marked lines and carefully broken up into the individual squares. The squares are then transported to the

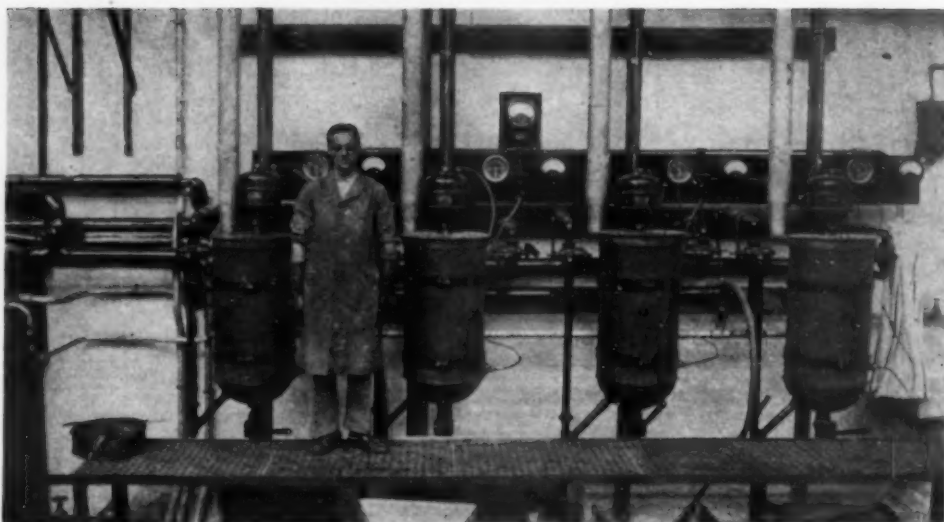


Figure 1. Twenty-five gallon copper water-jacketed kettle.

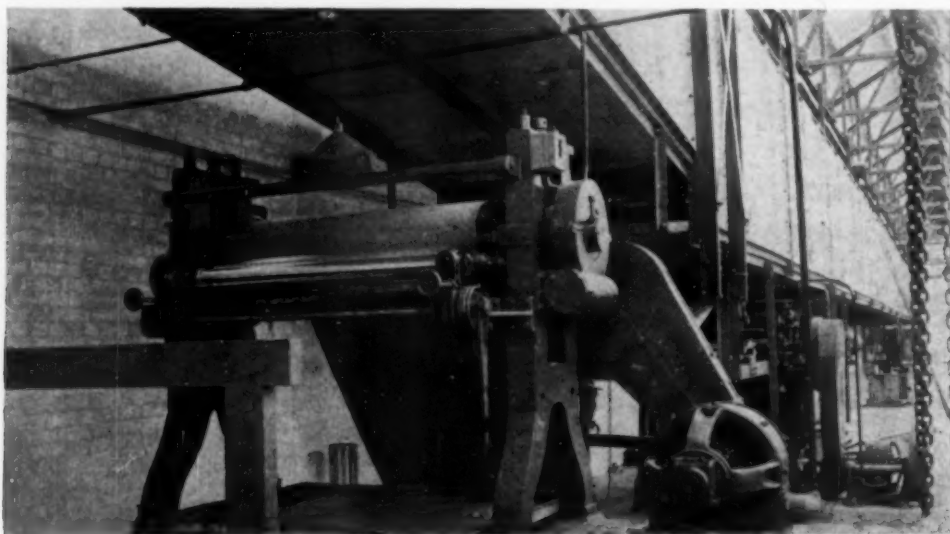


Figure 2. Paper coating machine.

press room, care being taken to prevent breakage in transit.

In the press room there is located beside each operator a steam table with a smooth metal top. Upon this table the operator places the squares of dough, until melted, and turns up the edges of each square. The squares are now ready for introduction into the press.

The record molding press is usually of the tilting-head type to facilitate access to the stamper molds on the head and plate of the press. A label is placed face downward through a pin in the center of the lower stamper; and another label is placed face upward in the center of the upper stamper. A square of molten "dough" is then spread uniformly over the lower stamper and the press is closed. The press temperature is usually about 300° F. and the pressure between 90 and 125 tons depending upon the size of the record. Usually, steam is circulated at first to ensure a complete melt; then, cold water is circulated to cool and solidify the molded stock. The press is then opened and the molded record, complete with labels, is removed. The record is then ready for trimming of the flash, polishing and inspection.

Shellac records have many disadvantages among which may be listed their weight, bulkiness, and extreme fragility. Research in later years has centered about the production of a record which is not only capable of giving true sound reproduction, but also is light in weight, flexible and for all ordinary purposes unbreakable. There are several types of unbreakable records on the market today to serve this demand, including those made from thermosetting synthetic resins and those made from the cellulose compounds, such as the acetate, nitrate and xanthate (viscose). Phonograph records made from compositions having a cellulose base have usually very little surface noise but in most cases the molded composition is relatively soft and lacks the mechanical strength of the thermosetting resins; consequently the records have a much shorter playing life.

Of the phonograph records made from thermosetting resins, those made from a resorcinol base (Durium Records) have proven the most practicable commercially. "Durium" is a synthetic resin produced by the condensation of resorcinol and formalde-

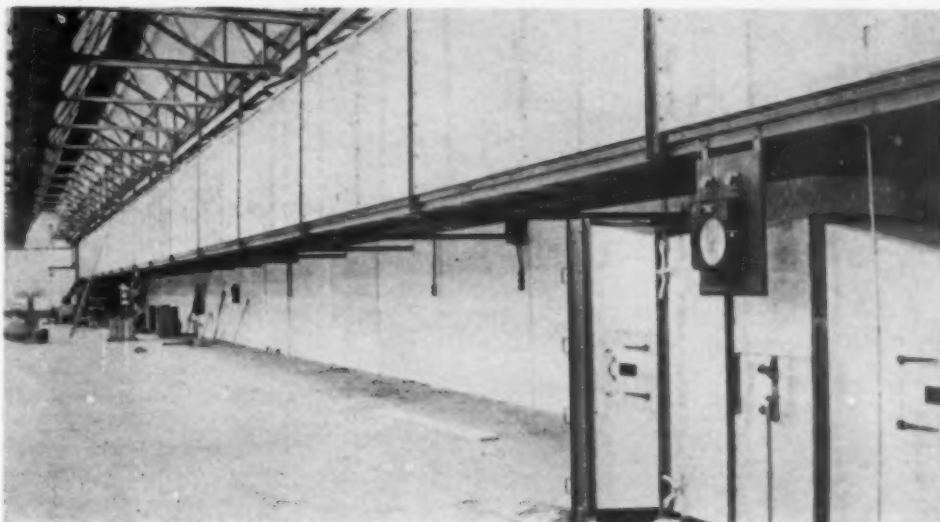


Figure 3. Drying tunnel through which heated air of constant temperature is blown.

hyde. Basically it resembles the reaction between phenol and formaldehyde. Durium resembles the phenolic resins in that it has high mechanical strength and electrical resistance and is not affected by weak acids or bases. Durium resin differs from most other resins in that the "curing" or final polymerization to the C stage under heat and pressure takes place almost instantly as compared with the usual three to five minutes cure.

The Durium process for the manufacture of phonograph records comprises seven operations. The records are made on a large scale and are of a uniformly high quality. Resorcinol and formaldehyde, together with the necessary amount of catalyst, are placed in a 25 gallon copper water-jacketed kettle (Fig. 1) fitted with the propeller shaft type of agitation. Heat is applied by circulating hot water. When the reaction has begun the temperature is controlled at 170-190° F. by circulating cold water. The alternate flow of hot and cold water is made possible by the use of a pair of three way valves on the water line of each kettle, one valve for inflow and one for outflow of water through the jacket. The flow of hot and cold water from the storage tanks through the system is maintained by means of centrifugal pumps, a suitable by-pass for each system being provided to prevent overheating when the water is not circulating through the system.

When the correct viscosity has been reached, the batch is rapidly cooled to room temperature and suitable solvents and plasticizers are added and intimately mixed. The liquid varnish is then filtered to remove foreign matter and allowed to run into a cylindrical copper tub fitted with a gate valve. It has been found impracticable to make larger quantities of resin in a single batch, not only because of the loss of solvent on standing but also because the reaction continues to proceed slowly and, in larger quantities, part of the batch would gel before the subsequent coating operation has been completed.

The copper tub containing the resin varnish is fitted with an air-tight cover and transported to the paper coating machine. (Fig. 2). The gate valve is then opened and the resin varnish allowed to run into the well of the machine. The paper used

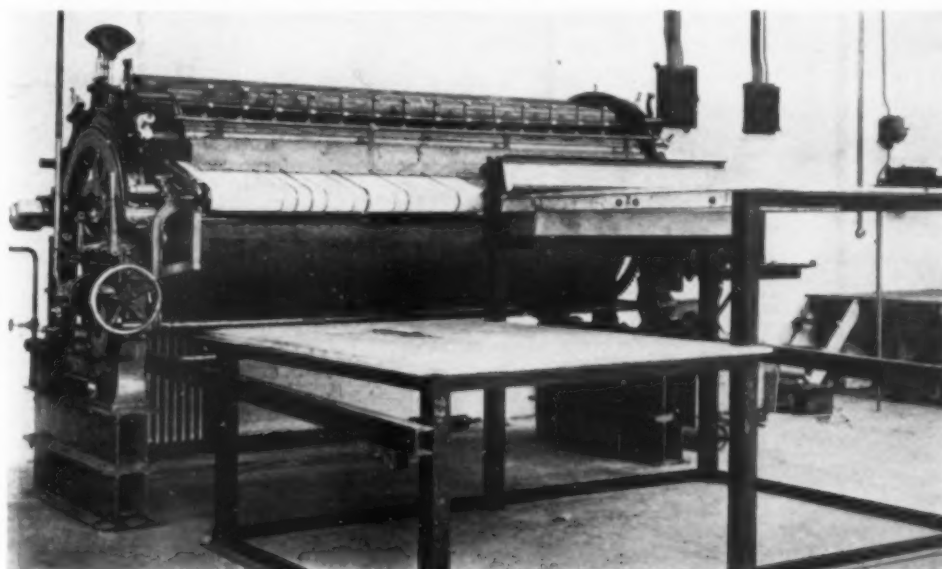


Figure 4. Mangle (steam heated) to remove the moisture entrained in the paper.

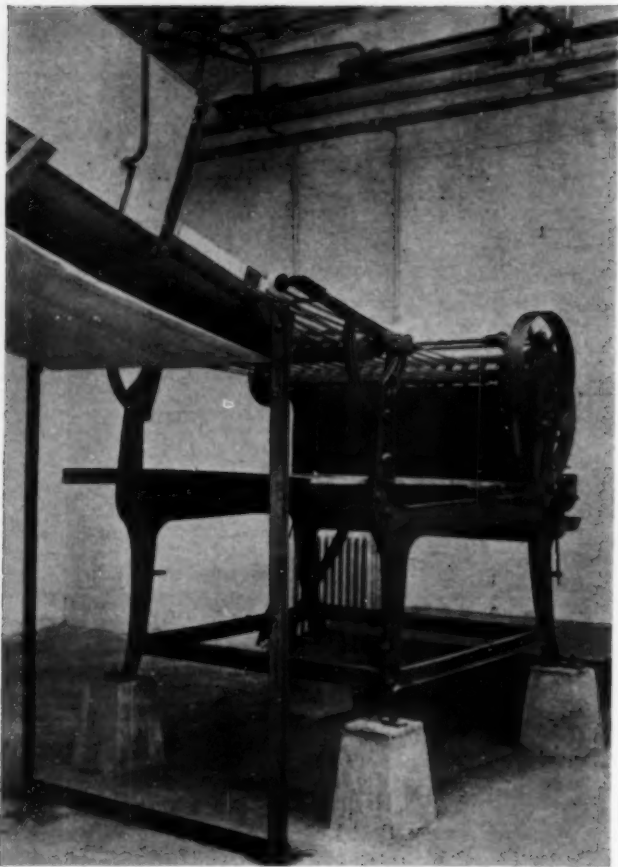


Figure 5. Coating machine for putting thin film of lacquer on reverse side of record sheets.

in this process must comply strictly with definite specifications of thickness, porosity, mechanical strength, etc. The film of varnish coated on the paper also must be of definite and uniform thickness. This is accomplished by means of a micrometer adjustment fitted onto the "Doctor" roll of the machine, by means of which a film of predetermined thickness is transferred to the paper. The paper in a continuous web is fed into the coating machine, and after being coated, passes along through a tunnel through which heated air of constant temperature is blown. This tunnel (Fig. 3) is about two hundred feet long and is equipped with steam batteries for preheating the air, air blowers and air exhaust units. The temperature must be kept constant to obtain uniform results. The paper coated with resin traverses the length of the tunnel, where the resin is dried, and then returns through the tunnel, emerging into a paper-cutting machine. Here the coated paper is cut into convenient size,

capable of accommodating twelve ten-inch records. Guide rolls operated by air pressure are placed at convenient points to keep straight the paper web on its passage through the tunnel.

The coated sheets, cut to size, are next passed through a mangle (steam heated) to remove the moisture entrained in the paper. (Fig. 4). The removal of moisture is necessary because its presence would cause "blistering" in the molding operation which follows. The sheets are usually pressed or molded immediately after mangling to prevent moisture being again taken up by the paper.

The molding operation takes place in a press the head of which holds twelve ten-inch record molds or stampers. The molding temperature is maintained at about 450° F. by means of thermostatic control, a recording thermometer giving a graphic history of temperature conditions while the press is in operation. The molding cycle, which is maintained by a cam of the correct size, is about three seconds. The sheets, coated with resin are fed into the press and ejected automatically by means of grippers which rotate in the correct cycle.

The sheets, each containing a dozen molded records are then given a thin film of lacquer on the reverse side on a small coating machine. (Fig. 5). From here the sheets travel on an endless belt through a short heated tunnel where the lacquer film is dried. The purpose of this operation is to seal the record to prevent absorption of moisture and the consequent warping of the record.

The sheets containing the molded records are next passed through a printing machine (Fig. 6) where each record is individually printed with the title, names of artists, etc. It is interesting to note that the printing is not made on labels which are pasted on the record, as in the case of the shellac record, but is made directly onto the resinous face of the record.

The sheets of records are next fed into a press similar to the molding press but which is fitted with circular knife edges instead of the stamper molds. Here the records are cut out of the sheets and fall into a large canvas container. The records are collected and passed to the Inspection Department where groups of trained girls minutely inspect each record for possible defects. Only flawless records are allowed to pass. These are packed in attractive envelopes and are ready for sale.

A ten-inch record made from this process plays on one side only; but each record usually contains two numbers and plays for five minutes which is equal to two sides of the ordinary shellac record. This is due to the unusual strength of the walls of the grooves which makes it possible to have two hundred grooves to the inch as compared with the usual one hundred. The life of a Durium record ranges between 75 and 125 playings as compared with an average of 50 to 75 for the ordinary shellac record. Recent research has made it possible to make a double-sided record with minor alterations of the process. These records are now being turned out in attractive colors, many of them having the words of a song hit, a scene from a play or other attractions printed thereon.

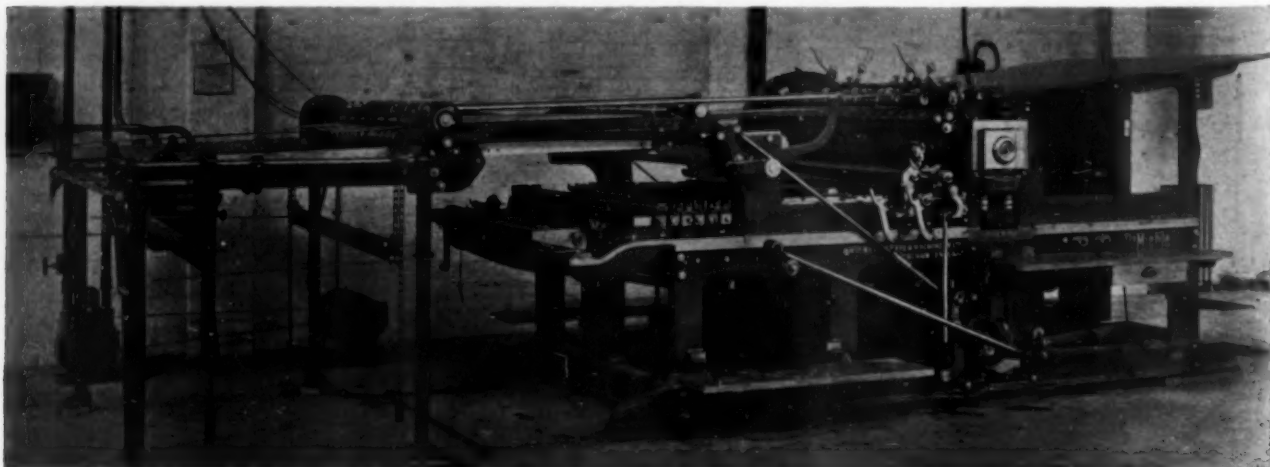


Figure 6. Printing machine on which titles of records are printed directly on the resin.

Types of Tests Obtainable with the "Flow Tester"

By Gilbert L. Peakes
Bakelite Corporation

IN THE first article of this series, the problem of measuring the plasticity of hot-molding compounds was discussed, and the "flow tester" built by Bakelite Corporation for this purpose was described. In the present article, the types of test information obtainable from the flow tester are explained.

Pressure Characteristic

The simplest and most direct type of test which may be made on the flow tester is the ordinary measurement of total distance

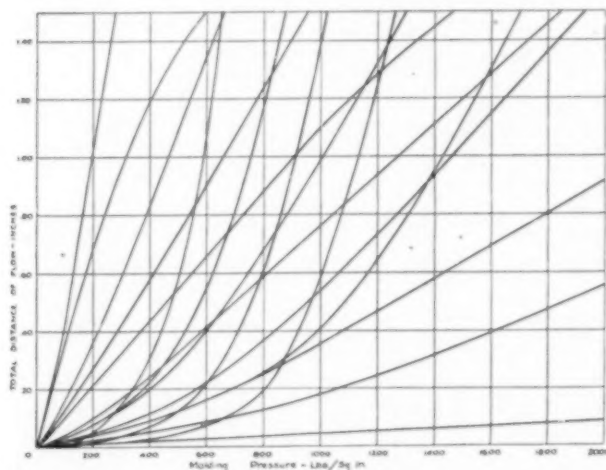


Figure 6. Showing variety of distance-pressure curves (temp. 150°C.).

of flow. For example, at a chosen standard condition, usually a temperature of 150° C. and pressure of 500 lbs. per sq. in., the machine is loaded with a tablet and flow allowed to take place until the material stops its own flow by setting. During this test the recording mechanism may or may not be connected. When flow has completely ceased, the split cone (see Fig. 7) is removed and opened. A steel rule reading to hundredths of an inch is applied to the molded piece and the height to which the material has flowed in the cone is read to the nearest hundredth. If the recording mechanism is used, this distance may be read from the chart, and direct measurement of the piece is not necessary. The total amount of flow so obtained is called the flow distance, and may be considered to be one of the properties of the material, as this testing device measures it.

This distance depends on the properties of the material, such as softness and rate of setting. Commercial compounds may vary in their results by this test from a distance of .15" at 3000 lbs.

per sq. in. for very hard material to a distance of 1.40" at 200 lbs. per sq. in. for very soft material. The most used classes of compounds, supplying the largest tonnage of the molding industry, fall in the range of .35" to 1.40" at 500 lbs. per sq. in. and 150° C.

While the total distance of flow, which a material attains at fixed pressure and temperature, may be called a property of the material, it is not a very fundamental property, since for any other sample a pressure and temperature may be chosen to give the same flow distance. We can, however, make tests of total distance at a series of different pressures, and then draw the distance-pressure characteristic, which is a more fundamental characteristic than the distance at single fixed pressure. In a series of such tests, as successive equal increments of pressure are added, the corresponding increments of flow increase, so that the line when plotted shows a slope which ordinarily is continually increasing with pressure. In Fig. 6 is shown a series of such distance-pressure curves, taken both on materials of different formulation, and on materials alike in formulation but treated to give different flows. Fig. 7 illustrates the appearance of the preformed tablets used and the molded pieces obtained in such a test, along with the split cone in which the pieces were produced.

These curves bear remarkable resemblance to the characteristic rate-of-flow/shearing-pressure curves which are so important a part of plasticity studies on pastes, clays, paints, etc. In plasticity studies at fixed temperature it has sometimes been found possible to translate such curves into a straight portion, indicating the yield pressure and the rate of response to pressure, and a curved transition portion, which traces the behavior of the material at pressures in the vicinity of the yield pressure. In a study of such curves made on the flow tester, it has been found possible in some cases to distinguish a rather definite yield pressure; in others, to plot to a straight line on logarithmic paper; and in still others, no rational behavior seemed indicated.

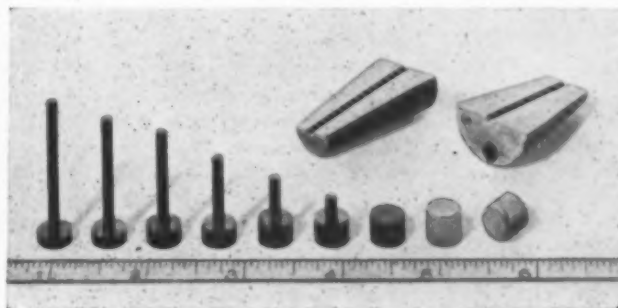


Figure 7. Preformed tablets used in test, molded pieces obtained, and split cone in which pieces were produced.

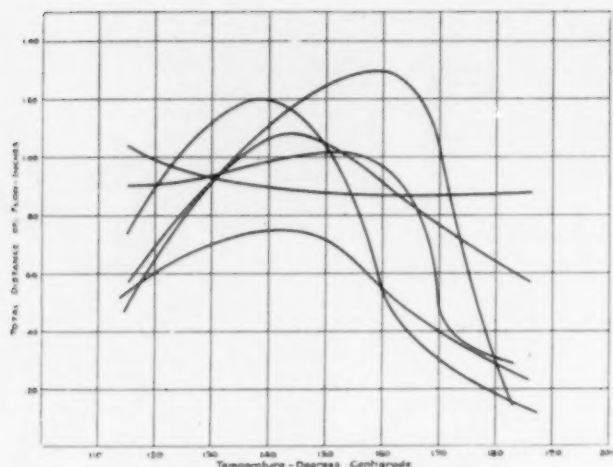


Figure 8 shows variety of distance-temperature curves.

Temperature Characteristic

While pressure is a direct variable, flow always increasing with pressure, temperature may be called an indirect variable, since flow may sometimes increase or sometimes decrease with increased temperature. If a given material be tested under constant pressure at a series of temperatures, another characteristic of the compound, its distance-temperature characteristic, may be plotted. For such a test, it is necessary to choose an individual molding pressure for each sample, such as to give a flow distance within the range of the instrument at the temperature of greatest flow. Too low a pressure does not show the shape of the curve well, and at too high pressure the flow becomes limited by the length of the flow tube rather than by the plastic property. In Fig. 8 is shown a group of distance-temperature curves illustrative of the general character of such data.

Minimum Molding Time

The flow tester was designed to measure plastic properties, as distinct from production rates or minimum curing times. It is possible, however, to measure minimum molding time by using a special solid cone in which the flow tube is absent. The results of such a test must be handled very cautiously in order to transfer them to results on some other mold. When a tablet is molded under the solid cone, the blister, if any, normally bulges out the ends, while the outer cylindrical surface retains its shape. It is therefore possible to measure the molded piece by micrometer, getting the center height and the edge height. The difference is the amount of blistering, and the minimum curing time has been arbitrarily defined as the minimum time necessary to reduce the blister measurement to .001" using standard tablet and molding conditions.

Detail of Testing

The action of an average material as revealed by chart records taken at 150° C., is about as

Figure 9 shows chart records of Sample A at various pressures (temp. 150° C.).

Figure 10 shows records of a variety of materials (temp. 150° C.).

follows: The flow starts instantly the pressure is applied, and proceeds evenly at a practically uniform rate for 10 to 20 seconds. Then the rate of flow increases within a period of about 5 seconds to a substantially faster rate, at which it will continue fairly uniformly for 5 to 15 seconds. A gradual decline of rate now occurs until finally the slope of the record line has been reduced to zero, indicating cessation of flow. This latter transition period may take from 5 to 30 seconds. It has been customary to gauge the total duration of flow, taking the end at that point, (multiple of 5 seconds) where the flow distance fails to increase by as much as .01" in 5 seconds at 150° C. This total duration ranges in commercial samples from 35 to 110 seconds. The duration time, however, is subject to some uncertainty due to the very gradual stoppage of flow, and is not an accurate measurement. If the flow of the material is stopped by its own hardening and not by limitation of the mold or quantity of material, the stoppage is always gradual, never sudden.

The arrangements for driving, stopping and resetting the chart permit superposing several tests on the same record. Having produced a single chart record, the operator may roll back the chart, reset it to the same starting point, and run again. This procedure is of advantage where the same sample is to be tested for uniformity, or under a series of chosen conditions, or where it is desirable to show different samples on the same sheet for comparison.

Fig. 9 is an example of simple distance-of-flow tests superposed on one chart, using sample A. These records show the increase of total distance with pressure, and illustrate also the very gradual rate at which the material stops its own flow by hardening. The points at which flow has ceased have been indicated with arrows, and it will be noted that the duration of flow becomes shorter as the pressure (or the total flow distance) increases. This decrease of duration of flow with increased pressure may be attributed either to the probability of increased heat absorption rate with the better contact of high pressure, or to the shorter time required to harden the thin wafer which remains under the cone when more material has flowed up into it. At this point it may be of interest to re-examine Fig. 7, where the thinner wafers which underlie greater flow distances are clearly shown.

Another example of superposing charts may be given, illustrated by Fig. 10. Each line is the record of a different material, all made at the same temperature (150° C.) and chart speed

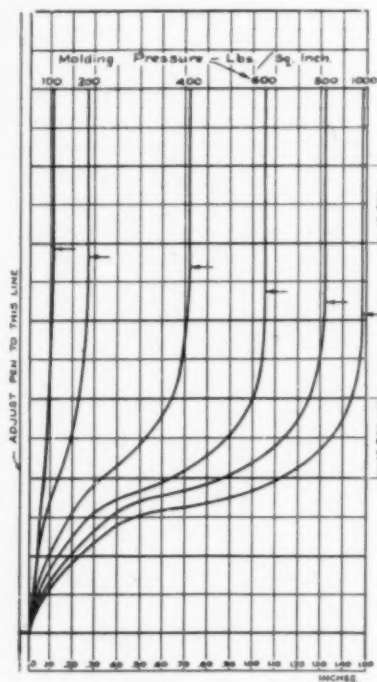


Figure 9

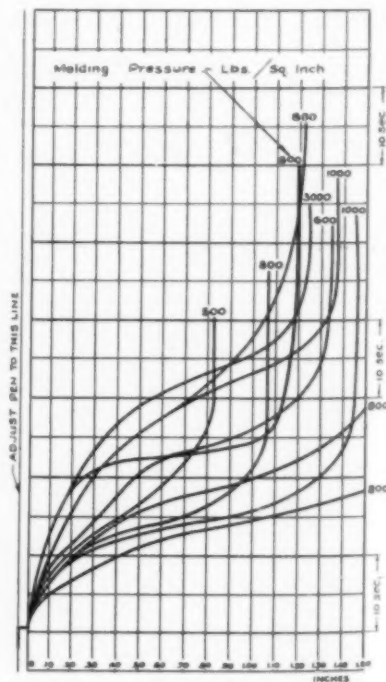


Figure 10

(6" per min.), and at a molding pressure individually chosen for each sample. The figures at the ends of the lines indicate in pounds per square inch the molding pressures which were used. These examples of chart record have been chosen to give an idea of the many diverse types of compound which occur. One sample tested at 800 lbs. per sq. in. pressure started off very rapidly and finished at a total flow distance of 1.07". Another at 800 lbs. per sq. in. started off much more slowly but went right on up to 1.50", and would have gone farther except for the limit imposed by the dimension of the flow tube. Other contrasts suggest themselves upon examination of the figure.

Size of Test Piece

Since hot-molding materials have two main characteristics, the softness and the rate of setting, obviously no test of softness can be made free of the effect of setting rate. It is also obvious that, since the setting rate is not being measured, its effect must be standardized. Time is required for heat penetration, therefore in order for tests to be comparable it is necessary to make them on equal thicknesses, rather than on equal weights. This truth seems to be obvious if a person's flow testing training has been along the lines of closing-time tests, but apparently is not so obvious to those persons who have based their flow work on extrusion tests, where the custom has been to test with equal weights instead of equal thicknesses, and to state the result usually by weight remainder or weight lost, without calculating the percentages concerned.

If quantity of material is measured by weight, then weight must be proportional to molded specific gravity in order to keep thickness or volume constant. Since molded specific gravity

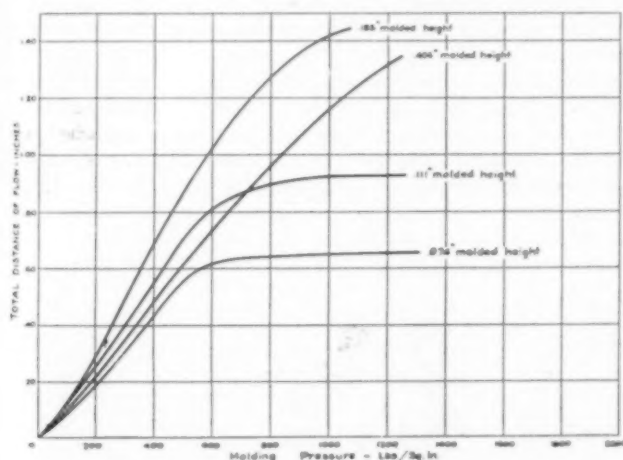


Figure 11. Sample B showing effect of sample size on distance-pressure curves, (temp. 150° C.).

may vary all the way from 1.27 to 2.05, constant weight plainly would not work. For example, if a constant weight were chosen to give a standard test-piece thickness of .100" with the ordinary specific gravity of about 1.37, then the thickness, calculating on the specific gravities cited, would vary from .108" down to .067". The effect of such thickness differences on the rate of heat conduction would obviously not be permissible.

Molded thickness has its effect not only on the reaction rate directly through heat conduction, but indirectly in turn on the softness measurements as well. Therefore, for all tests in which any sort of accuracy or correlation with previous results is required, it is necessary to hold constant molded volume. Since, as indicated, the molded specific gravity of different materials varies over quite a wide range, a simple method of determining constant molded volume becomes desirable. The diameter of the charge chamber is constant, therefore the problem resolves itself into the use of a quantity of material which will mold to a cylinder of a definite height when no flow is permitted. For this purpose a solid cone is substituted for the one with the flow tube, and the height of the cylinder molded against it is measured

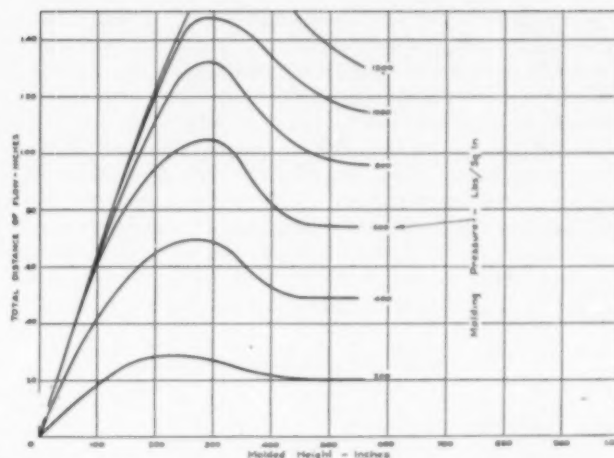


Figure 12. Sample C—distance molded height curves showing effect of pressure on relation of molded height to flow distance, (temp. 150° C.).

with a micrometer. The height of this cylinder is designated as the "molded height". A standard "molded height" of 0.266" has been chosen, applicable to all materials tested.

The method of establishing the standard molded height may be of interest. Sufficient sample must be present in the charge chamber to permit the flow tube to be filled, should the compound being tested be sufficiently soft, or the pressure sufficiently high. Based on the ratio of areas and on the length of the flow tube, the required molded height would be .162". Actual tests show that this theoretical minimum charge cannot be made to fill the flow tube, therefore the choice of volume must disregard calculation and depend on test.

The method used was to make up a series of tablets ranging from that quantity which will about half fill the flow tube to that which will substantially overfill it, and then to run a distance-pressure curve from each constant-weight group of tablets.

With some exceptions, the behavior is as follows: Starting with small but constant quantity, tests are made at low but increasing pressure. The resulting flow distances begin to increase more rapidly than the pressure, causing the curve to bend upwards. At a point where the quantity of material present is no longer sufficient, the curve rapidly begins to flatten out to a horizontal, indicating that maximum flow has been reached for the quantity used. At a somewhat greater quantity of material, that is, greater molded height, the test is repeated, and it is found that the curve flattens out at a higher flow distance. The standard value was chosen to be slightly more than that which would give a distance-pressure curve which would not begin to flatten out up to a flow of 1.50", the limit of the machine. This value was taken to be .266". Curves which illustrate the tests, using sample B are shown in Fig. 11. The same data may be plotted in the form of constant-pressure curves, where total distance of flow may be plotted against molded height. A group of such curves, taken on sample C is given in Fig. 12. These curves show that there is a molded height at which maximum flow occurs, and that, as the pressure (and consequently the flow distance) increases, this optimum molded height also increases. This being so, the standard molded height should be chosen just above that at which maximum flow occurs, since the use of an unnecessarily great quantity would merely make the tests less sensitive in disclosing the variables which are looked for. Another reason for choosing the standard molded height at the point which gives maximum flow is that errors of determining the correct tablet size, or of variable weight on successive tablets, are minimized.

The size of test piece has a small but definite and very significant effect on the distance-temperature characteristic. In Fig. 13 will be found the temperature characteristics for sample D tested at 600 lbs. per sq. in. with the standard quantity and with double the standard quantity. The temperatures at which

maximum flow occurs have been called optimum temperatures, and are read from the curves as follows:

Standard quantity —147° C.

Double quantity —140° C.

It is believed safe to assume, since so many compounds show an optimum temperature on the flow tester, and since in many cases a commercial mold will fill with a given compound at moderate temperature but not at high temperature, that any mold will show an optimum temperature if the material will afford one.

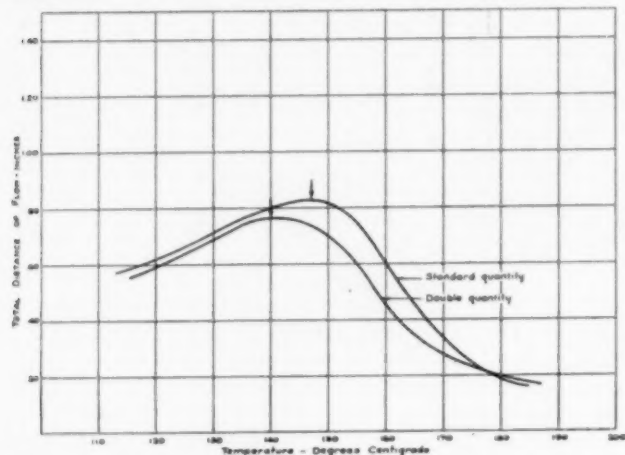


Figure 13. Sample D—distance-temperature curves showing effect of quantity of material on optimum temperature, pressure 600 lbs. sq. in.

In the case of the sample cited, the optimum temperature is lower for the larger piece. This has been confirmed in a number of cases, of which the above is cited only as an example. Reasoning from this behavior to commercial molding would lead to the probability that thick pieces would in general mold more easily at reduced temperatures; or, to put the same thing another way, a thick piece will in general require more pressure to obtain flow equal to that on a thin piece. In confirmation of the above theory, it is known that pieces comparatively large and thick, such as spinning pots, bowling balls, etc. can be more readily filled at temperatures of 130° C. to 150° C. than at temperatures of 170° C. to 185° C.

Tablets

The preferred design of the flow tester is such as to load from underneath and force the material upward. The only practicable method of doing this is first to form the powder sample into a tablet, since powder could not readily be loaded from below.

In the early work on this test method, use was made of a small hand mold for the forming of tablets, but that was unsatisfactory and was soon abandoned in favor of a small pre-forming press, hand-driven. Power drive and automatic feed might be applied, but on account of the fact that usually only short runs of 2 to 20 tablets are made with a single setting, hand drive and hand filling of the die have proved more convenient. In Fig. 14 is shown a photograph of the type of machine found most convenient for this work.

The data presented above show that the proper amount of material to use is that which will mold a cylinder .266" long, when completely confined in the charge chamber without any flow. To determine this amount the tablet machine is set for any convenient but known depth of cell, measured by means of a steel scale graduated in hundredths of an inch which is dropped into the die. The unknown sample is loosely poured into the die, scraped level, and pressed to a tablet. This tablet is then transferred, without measurement of any sort, to the flow tester, and is there molded under the solid cone a sufficient time to cure it without blisters. On removal the length of cylinder is measured by micrometer. A simple calculation by proportion then gives the tablet machine cell depth required for making

tablets which will mold to a height of .266". For making standard tablets the tablet machine cell depth is then reset to the depth indicated by the calculation, and sufficient tablets for the desired testing are run off. The molded height can with the best of skill be readily held to $\pm .002''$, but routine work is sufficiently accurate if the molded height be held to $\pm .005''$.

The bulk factor of a compound may be defined as the ratio of the volume of a given quantity of material in powder form, to the volume of the same given quantity after molding. This is equivalent also to defining the bulk factor as the ratio of molded specific gravity to powder apparent density. As between successive samples of different compounds presented for test, each has two possibilities of change in respect to the quantity of powder to be used for tablets. If only the bulk factor varies, equal weights of powder must be taken, but different volumes. If only the molded specific gravity varies, equal volumes of powder must be taken, giving different weights. Usually both factors are likely to vary, but, using the method here recommended of working direct to molded volume, it is unnecessary for tablet making purposes to directly determine either the apparent density, the molded specific gravity, the bulk factor, or the tablet weight.

The one figure which is determined, namely, the tablet machine cell depth necessary to give the standard molded height, permits the calculation of bulk factor quite simply whenever that figure is desired. The tablet machine die diameter and the flow tester charge chamber diameter are so slightly different that no appreciable error is made by assuming them alike. Therefore, the lengths of the two cylinders of material are proportional to the volumes, and the ratio of lengths becomes the bulk factor. For example, if it is found that a cell depth of .77" is necessary to give a molded height of .266", the bulk factor then is the ratio of these two figures, 2.9 to 1. The measurement of tablet height does not enter.

It is sometimes desirable to test powders so fluffy that the maximum cell depth available in the tabletter is not sufficient to contain the standard quantity. It has been established, on materials having normal bulk-factor, that two half-size tablets give the same result as one full-size tablet. Therefore, it is assumed that the same would be true for materials of high bulk factor, and that two half-size tablets give a result on all compounds, equivalent to that obtained on one full-size tablet.

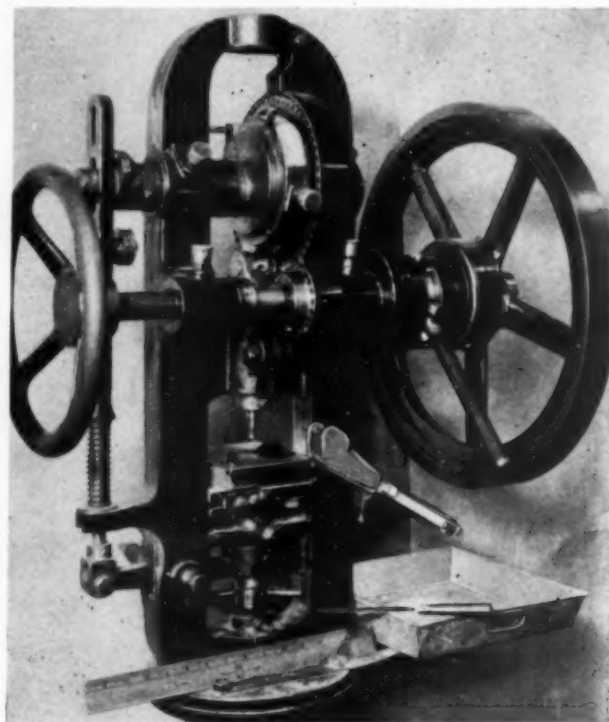


Figure 14. Tabletter.

An important difference between the general action of the flow tester and that of commercial molds, is in the constancy of molding pressure. The flow tester mold load is provided by gravity weights, which are dependably non-fluctuating. The weights in falling downward, as they follow up the flow of the material, always accelerate so slowly that no error of pressure results. In addition, the design of the flow tester is such that, throughout the test the entire load is applied to a constant area of piece. In commercial molds, there is usually a land area provided, in the form of a horizontal surface completely surrounding and joining with the piece, across which excess material may escape as the mold closes. As such a mold begins to close, assuming that the hydraulic system supplies full pressure as fast as the material in the mold gives way, the entire pressure is concentrated first on the pins or bosses which project lowest from the force, or highest from the chase. As a result the unit pressure on these parts of the mold is very high, and the material gives way gradually and flows to comparatively empty and comparatively pressureless sections of the mold. As the closing continues the area of mold applying pressure to the charge increases, thus decreasing the unit pressure. The usual molding procedure provides some excess of material, which then begins to overflow across the land. As soon as any material comes on the land, that surface too takes some of the pressure. Thus from beginning to end of the usual closing operation the unit molding pressure is decreasing. Other complications are that frequently the hydraulic supply cannot follow up the flowing compound fast enough, and also that closing operations are frequently conducted with partly opened valves, or with separate low-pressure systems. In the absence of a low pressure hydraulic system there is sometimes a period of stalling. In view of such complications, modified still further by the various shapes and depths of molded pieces, it would be impossible to choose for testing purposes a universally satisfactory variable-pressure cycle. Due to the above mentioned variations in pressure, accurate and duplicate tests to evaluate a molding material become difficult and to that extent unreliable in using a commercial mold for these tests. The correct evaluation of the molding material is based upon flow under heat and pressure, therefore the simple solution is pressure totally without variation caused either by the mold design, the press design, or the molding procedure, and this is the condition which obtains in the flow tester.

The pressures applied to the bottom of the tablet in the charge chamber by the ram, and to the flowing rod of material in the cone, are each constant throughout a test. This means that the constant differential between the two during a test is spread over an increasing distance as the material flows into the cone.

In the design, checked by careful calibration on each machine, the pressure of 40 lbs. per sq. in. exerted by the first follower rod and its weight is balanced by the proper extra amount of weight added to the bottom operating weight. The final result of calibration is that the bottom weight is sufficient to overcome the static friction of the machine, and to provide 40 lbs. per sq. in. for balancing the pressure of the follower rod. In practice it also provides 100 lbs. per sq. in. net molding pressure, since tests at pressures lower than that are never required. To sum up, the bottom weight does the following things:

- A. Balances the weights of moving parts.
- B. Balances static friction.
- C. Provides 40 lbs. per sq. in. molding pressure to balance the follower rod.
- D. Provides 100 lbs. per sq. in. to give the first step of net flowing pressure; this amount is compensated for dynamic friction.

Thus a pressure designated as 1000 lbs. per sq. in. is actually the net pressure caused by 1040 lbs. per sq. in., working against a back pressure of 40 lbs. per sq. in.

The temperature of test is taken nominally as the reading of a mercury thermometer with $1\frac{1}{4}$ " immersion in the split cone through which the material flows. The thermometer used must

be calibrated for that immersion. Temperature control is obtained by a simple steam pressure regulator, on which adjustments of the hand wheel may be made to bring the thermometer to the desired reading. Steam from the pressure regulator is led first through the ram, then through the steam chest and out through a trap to the sewer. The ram is drilled hollow and by means of a feather the steam is forced to travel up one side of the hole and down the other, thereby preventing any possible air pocket. It is ordinarily easy to keep the temperature within $\frac{1}{2}^{\circ}$ C. of the desired setting. For checking purposes a small thermocouple hole is usually provided, in which the temperature just under the top molding surface of the ram may be taken.

Rate and Economy of Testing

The rate of production of tests from the flow tester may be interesting. Using 150° C. as the standard test temperature, a complete cycle of operations, including tabletting, charging, testing, opening, cleaning, reclosing, recording, and resetting may be accomplished, according to the type of material, in from $1\frac{1}{4}$ minutes to $3\frac{1}{4}$ minutes, usually averaging around $2\frac{1}{4}$ minutes. It is believed that this rate compares favorably with any other method.

Economy of material used may also be mentioned. For a cup closing time test a commonly used design of cup requires about 37 grams of the ordinary type of wood flour filled material. A charge of similar material for the flow tester weighs 0.66 gram, the ratio being 56 times. This very matter of the small amount of material used becomes a requirement for good design and good workmanship in preventing loss of material in fins, since any material so lost might be likely, more so than in commercial pieces, to alter the quantity or character of that portion of material remaining under test.

Accuracy and Sensitivity

In rating the quality of any test it is necessary to apply two criteria simultaneously:

- A. Repeat tests on the same sample should be as alike as the character of the sample permits.
- B. Tests on different samples should differ as widely as possible.

Checking A on the flow tester, certain materials give excellent agreement of repeat values, while others, usually the exceptions, give considerable variation of values among repeat tests. As examples of what may occur, Table I gives the results of distance of flow on two samples E and F.

Table I

(Illustrating Criterion A)	Sample E	Sample F
Pressure, pounds per sq. in.	1000	600
Temperature, $^{\circ}$ C.	150	150
Distances, inches67	.96
	.87	.91
	.54	.93
	1.02	.92
	1.10	.96
	.50	.93
	.83	.94
	.58	.93
	.98	.92
	.52	.92
	.65	.93
	.83	.92
	.74	.92
	.73	.93
Average75	.93
Av. Deviation	21% (E)	1% (F)

The variable results from sample E are not due to faulty blending or lack of care in manufacturing, since no amount of reblending will give constant test results, but due to an inherent characteristic of the material. Pressure also has been found to have no effect on repeat accuracy. It perhaps should be stated that sample E represents a type of material which was much in demand 10 to 15 years ago, but which is no longer of commercial importance, though still in use to a small extent. The flow tester reliably picks out such undesirable materials. The ordinary types of material may be expected to check on repeat tests to an average deviation of less than 3%.

Likewise, it should not be assumed that such variable results are due to failure of the flow tester since the results obtained in testing sample F indicate excellent repeat accuracy.

Criterion A may be called the accuracy; B, the sensitivity of the test. The sensitivity may be rated by testing a group of materials known to be different, by each test condition or each test method. The average value for the different materials by each test may then be taken, which in itself means nothing but serves as a base from which to calculate the per cent. average deviation for use as the measure of sensitivity. On a certain group of five materials, Table II presents the deviation percentages obtained when using various plasticity methods now or formerly in use for testing molding compounds.

Table II

(Illustrating Criterion B)

Method	Average Deviation
Flow tester, closing time at 1600# 150° C.	15%
Cup closing time, 100# steam.	20%
Cup closing time, 150# steam.	27%
Weight extruded, 5" disc center overflow.	32%
Flow tester, pressure to flow 1.00" at 150° C.	33%
Weight extruded, 2" disc edge overflow.	35%
Flow tester, distance at 300# 150° C.	112%

These figures show not only the general superiority of the flow tester distance test in sensitivity over other methods, but also show, as between the first and last items, the superior sensitivity of the distance-of-flow measurement as compared with the closing-time measurement, both being made on the same mold. The percentage figures obtained in such a comparison will naturally vary widely according to the selection of samples to which the testing is applied, but the figures above were actually obtained and are presented as typical comparisons illustrative of the principle, which has been confirmed a number of times.

On another group of five different samples, all different from the former group, the distance values gave a deviation of 20% at 600 lbs. pressure, but closing time test (on the flow tester) at 1000 lbs. pressure gave only 9% deviation.

Part III of this article will describe the applications of flow tester results to commercial work.

Discoloring Eliminated with New Phenol Resin

One of the difficulties which all makers of phenolic resins for use in paints and varnishes have long sought to overcome is reported to have been accomplished by use of a pale oil-soluble resin, said to assure an oil enamel film with no after-yellowing or odor. It is expected to bring much wider use of phenolic resins in finishes used for architectural and industrial applications, especially where clear or light colored finishes are desired.

The company introducing this resin claims to have produced for the first time a phenolic resin satisfactory for use in making a true white. Announcements indicate that the new resin permits of cooking at temperatures as high as 575° F., and that even at this extreme temperature there need be no fear of jellying. The product is said to be excellent for the making of oil varnishes the air-drying and baking types, paint vehicles, blending varnishes and pigmented finishes.

Argentine Bakelite Industry

The Bakelite industry in Argentina, especially the manufacture of articles from Bakelite is rapidly becoming more important according to the Department of Commerce. So important has this industry become that a plant has been established for making Bakelite in two forms, designated as a. & c. The first state is that of an oily liquid which can be made more viscous and elastic by the application of heat and which at ordinary temperature will become solid. In this state it is fusible and soluble in organic solvents such as alcohol, acetone, phenol, glycerine and lye. The latter state is that point at which Bakelite can be worked efficiently becoming brittle afterwards and losing its ability to be worked.

The firm manufacturing Bakelite in these two forms does not make the articles but sells the Bakelite in the above forms to many of the eighteen plants manufacturing these articles. The blocks made by this firm are in all colors, transparent, opaque, clouded, striped, spotted, streaked and marbled.

In 1932 there were 110,000 kilos or 242,506 pounds of Bakelite imported into Argentina and it is reported that most of this came from Germany. Of this amount 40,000 kilos or 88,184 pounds were in powder-form and 70,000 kilos or 154,322 pounds were in block form. Imports so far this year are believed to be greater than for the corresponding periods of last year.

Buenos Aires is the center of the Bakelite industry. The 18 firms reported to be manufacturers of articles of Bakelite are located there.

Low Temperature Tar Distillates

by K. A. Loven

Lehigh Briquetting Company

Low temperature tars from lignite or other coals differ materially from high temperature tars obtained from the same coals, the former belonging to the aliphatic and the latter to the aromatic series. Low temperature tars from the same coal also differ materially according to temperature of carbonization, internal or external method of heating, catalytic or cracking action, etc., all of which affects the possibility of obtaining resins from such crude coal tar or its distillates. It also affects the amount of recovery of phenolic acids.

Low temperature tars from lignite and other coals generally show some phenols applicable to the manufacture of resins, which experience, however, has shown is not always true. Low temperature tar oil as produced from North Dakota lignite has a high content of phenolic acids. These are of the type boiling above 200 degrees C. The tar oil from this particular type of lignite after the removal of asphalt shows approximately 60% phenolic acids.

Such oil can be converted entirely into a resin, without separation or extraction of its neutral oils, which however may not necessarily be the case with tar oils from other lignites. The resultant resin is limited to dark colors. To produce it in lighter colors, a secondary distillation and purification is necessary, likewise, extraction and separation of neutral oils from acids. All of the acids and bases are available for a resin product. The bases play an important part in the condensing of this material.

Catalytic action can be brought about with or without a foreign catalyst, of which a wide variety can be used, generally alkalines or mild acids. For a fast setting resin, ammonia type catalysts can not be used successfully. However, with a proper procedure and catalyst, a very fast setting resin can be obtained, likewise an oil soluble varnish using either linseed or tung oil. The process is fairly simple and inexpensive.

Resin from Shale-Oils

Laboratory tests carried out by the Estonian shale oil industry show that by using the phenolic constituents of shale oils it is possible to obtain resins which are practically transparent, non-brittle and which are resistant to high temperatures.

Styrene Resins

As Substitutes and in New Applications

By Samuel Natelson

THERE has been a growing interest in thermoplastic and oil soluble resins in accordance with the rapid increase in their use and application in new capacities and as substitutes for more expensive materials. Attention has been directed, in the last few years, towards polymerized styrenes as a member in this group because of the special properties which make this resin particularly valuable.

Styrene, which derives its name from the fact that it is found in liquid storax or styrol, as it is sometimes called, is a highly refracting pale yellow to colorless liquid, the presence of which gives the characteristic odor to illuminating gas. This compound has the structural formula, $\text{CH}_2\text{:CHC}_6\text{H}_5$ and is therefore a vinyl benzene. The polymer of this product may be classified with the vinyl resins although it is distinguished from them in that styrene is a hydrocarbon while the vinyl chloride and acetate polymers contain oxygen or chlorine.

Since styrene is a hydrocarbon it is not highly polar in nature and even this polarity is largely lost when the double bond is saturated in the process of polymerization.

This compound polymerizes readily when pure in the light or under the influence of bands of heat. Dissolved in different solvents, however, the time of polymerization increases with dilution. In solutions of about 50% concentration, as it is often obtained, polymerization is slow and catalysts are needed to speed up the process. Polymerization must be carried out in the absence of air if a colorless product is desired. The process of polymerization is a gradual one and can be stopped at any point so as to obtain a product which ranges in property from a soft tacky material to a non-tacky viscous mass and finally to a hard transparent plastic resin. If the plastic resin sometimes called meta styrene is heated in air at 200° C. for one hour, it goes rapidly over to the brittle modification which is amber in color.

The color of the resin depends upon the conditions under which polymerization takes place. Absence of oxygen will give rise to a transparent material which is practically colorless in appearance with an occasional faint greenish yellow tinge visible in thick layers of the material. This desirable polymer may be obtained by either polymerizing in solution or by polymerizing the pure styrene for about one-half hour at 175° C. in the absence of air in a sealed tube or autoclave.

Styrene polymer is soluble in most organic solvents and oils. It is thermoplastic and can be pressed in the desired mold with mild pressures at temperatures from 200°-350° F. It will burn under heat and will burn slowly of its own accord when free of organic solvents. When compounded with asbestos and oxides of various metals it will not burn at all. Usually the meta-styrene obtained is not free of chlorine which also seems to hinder its combustibility. Its machining qualities are good. The material may be marketed in the form of sheets, tubes or rods or any shape being easily molded to the desired form.

This plastic can be compounded to any color desired with the various pigments and organic dyes. With gold chloride charac-

teristic fluorescent effect may be obtained. Ageing of the material, in the author's experience, seems to have no effect nor is the material affected by hot or cold water. Meta-styrene will resist corrosion, being unaffected by the usually encountered acids and alkalies in the cold. On long standing in bright sunlight a slight surface oxidation is sometimes visible. However, there is no tendency of the material to unmold. If not completely polymerized there is a slight tendency of the material to cold flow.

Styrene resins lend themselves readily to being compounded in lacquers and coverings for wood or metal, smoothly taking the shape of the article covered without cracking or drying and giving the high lustre characteristic of styrene polymers. The polymer has also been compounded with catchouc to obtain a plastic with special properties.

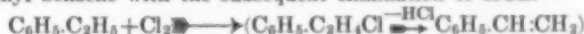
The tensile strength, hardness and plasticity compare favorably with that of the phenol-aldehyde resins. The specific gravity of the uncompounded material is 1.06.

Numerous patents have been granted for widely varying applications of this plastic, from its use in dental casts to its use as a surface covering. However, its most valuable application appears to be in the field of insulators. Its breakdown voltage of 517 at 60 cycle volts per mil. when uncompounded places it high up in the field of insulators. It is here that styrene resins find their most important and promising application as part of the many electrical devices synthetic resins may be used for.

The properties of the styrene resins may be varied by varying the starting material. If instead of styrene, methyl, chloro or ethyl styrene is used, the polymerized product will be affected in property by the characteristics of the group included. Chloro-styrenes decrease the combustibility of the resin formed while methyl and ethyl styrenes contribute to the greater solubility of the resin in the different solvents. Mixtures of these different polymers might also be used.

The starting materials for styrene manufacture are ethylene and benzene. The low cost of these starting materials should give a resin whose price should be as low as the cost of the high-grade phenol-aldehyde resins, considering that benzene makes up about 75% of the final molecule. However, at present, the preparation is roundabout and the yields are not as high as they might be. Some styrene is also obtained, nevertheless, as a by-product in the oil and coal industries.

The usual methods suggested and applied in the many patents granted are no more than improvements upon the methods already existing in the chemical literature for more than forty years. Most of these patents depend upon the chlorination of ethyl benzene with the subsequent elimination of HCL.



Numerous methods and catalysts have been proposed for the elimination of HCL ranging from inorganic acids and salts to organic amine salts. In the above procedure it is obvious that 70 grams of chlorine are being expended for the production of a

maximum yield of 104 grams of styrene, at the same time the yield is far from being quantitative.

To avoid this use of large quantities of chlorine, methods have been proposed for the elimination of the two hydrocarbons from ethyl benzene either by high temperatures alone, with catalysts or with special dehydrogenators such as sulfur.



These methods are fraught with difficulties in that poor yields are obtained with much polymerization of the material to undesirable brittle and highly colored polymers.

Distillation of cinnamic acid is too expensive a process to be considered of value commercially although it affords an excellent method for obtaining a limited supply for laboratory purposes.



A promising method is one which at present gives poor yields and many undesirable by-products. It consists in the direct condensation of acetylene with benzene.



The dehydration of methyl phenyl carbinol, patents on which have been granted to German manufacturers, requires that you first manufacture the expensive methyl, phenyl carbinol or phenyl ethyl alcohol (rose oil).



A few methods reported in the literature about thirty years ago are promising if the right conditions for good yield could be obtained. The polymerization of four acetylene residues gives poor yields of styrene.



The direct condensation of ethylene with benzene gives small yields of styrene.



The extent to which styrene plastics will be used in the future in the resin field depends upon the development of a low cost method of production. The rapidly increasing literature on the subject indicates that this problem will probably be solved more completely shortly.

Package Design Plus Sales

By Irma E. Marohn
Robert Gair Company, Inc.

A PRODUCT after it has been perfected is dependent, in the last analysis, upon the intervening medium, the package, to bespeak its qualities and advantages. The package must succeed in its mission as a persuasive though inaudible salesman in arresting attention and holding interest thereafter until its message reaches its mark and prompts the potential consumer to purchase. It certainly may not obscure or confuse the appeal of the contents; it must heighten that appeal. The package should be a powerful selling personality and in fact should go beyond that since "a powerful selling personality" can contact only comparatively few prospects or customers at best, but a well planned package can be made a powerful selling personality that contacts thousands.

Changes in the requirements of carton treatment have been enforced by the increased use of open display. The top and sides of the carton have become increasingly important with recent developments and have added significance to the carton's third dimension because of its display on counter or floor stands. Under these conditions, the continuity of design around the package, rather than the treatment of individual panels as separate units is essential. Family tie-up between individual cartons, displays and shipping cases is of vastly greater importance in this new scheme since the several units are frequently shown together. The closer range of vision fostered by new display methods enables the designer to use refinements in designs as well as less vociferous colors than heretofore. The height of the line of vision for open counter display generally is slightly lower than when cartons were designed wholly for shelf display.

Depressed business conditions have brought into use cartons which in their striving for attention violate all known optical laws—garish colors, packages crammed to the margin with text and pictorial non-essentials, lettering of a size adequate to advertise a locomotive, colors that seek to out-shout their competitors. But more recently there has been a noticeable return to the standards of good taste, good art work, beauty, suitability of lettering to the product and the merchandising scheme, avoidance of dull, stereotyped copy, all of which appeal to the good taste and intelligence of the buyer.

What Constitutes a Successful Package

1. Construction: Stability, distinction of shape, suitability of materials to the product and the packaging machinery, opportunities for advantageous lay-out and economical shipment are major considerations along with an attitude of humbleness

toward consumer convenience as a definite essential in package construction. Considerations of moisture exclusion or retention in the package, also of visibility of contents should determine the use of such processes as waxing, asphalt interlining and the inclusion of transparent cellulose materials.

2. Color: Freshness is a dominant requisite as is suitability to the contents. A survey of the competitive field is essential and an effort should be made to break away from typical treatment so that distinction and uniqueness may be achieved. The importance of color may be gathered from the results of a test recently conducted by Proctor and Gamble before determining on a new wrapper for Camay soap. Nineteen thousand seven hundred and sixty women interviewed disclosed that they react to color but apparently disregard design. Whether for masculine or feminine appeal, a pleasant balancing of color and harmonious proportioning is essential. The beauty achieved has a definite economic value.

3. Design: Lettering, suitability, distinctiveness and simplicity must be considered.

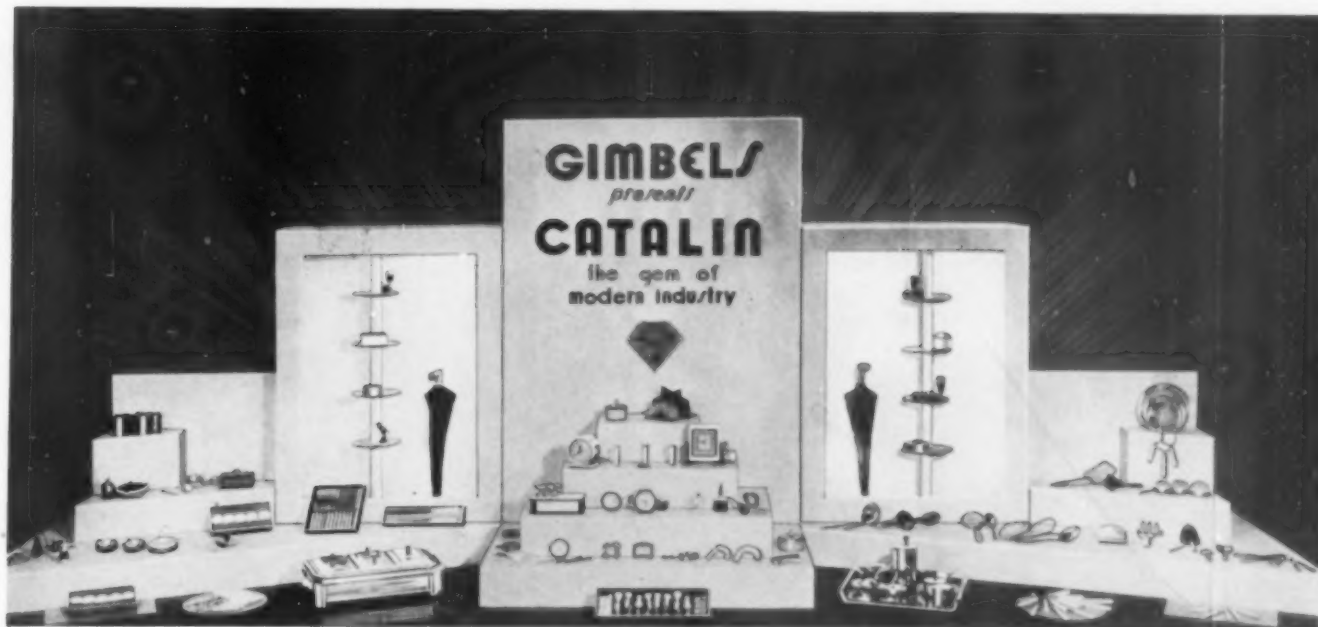
4. Displays: There is increased appreciation of the fact that the most successful displays serve as a subordinate background for the goods. They succeed most emphatically when they guide attention toward the goods rather than attract it to themselves. Therefore, the use of neutral colors is advantageous, except in cases where the display container is intended to repeat in larger size, as in floor displays, the design of the individual carton. Today—the designer must be pretty much of an engineer as well as an artist. The time has passed when all that was required was the drawing of a pretty picture. He must be placed in a position to do his thinking before he does his design, and he cannot do this logically or effectively without having all of the available facts concerning the product and the production and merchandising plans involved.

It is necessary to consider the market and the class of customer to whom the product and the package are to appeal. Is it desired to reach a sophisticated clientele or is it planned to reach the immigrant who can scarcely read English? Is the prospective buyer masculine or feminine? All of these questions are tremendously important and we must gauge the appeal of the package accordingly. It is necessary likewise to consider the kind of competition the package must meet and with this in view there should be time allowed in the planning of the package to study the designs under consideration in relation to rival packages. The package may be utilized to give a fresh impetus to sales by renewing the enthusiasm of salesmen and retailers.

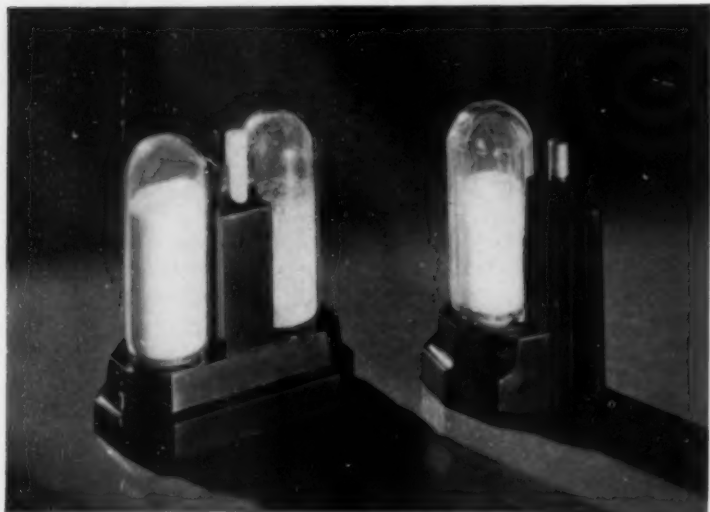
Plastics in Pictures



Great strides have been made in package design in the past few years through the use of plastics, especially in the drug field. From a humble beginning in this field in the form of a collapsible tube cap, Durez is used in packaging work in thirteen different ways, each new product taking on an added feature and advantage.



Door knobs, umbrella handles and what not were featured in this exhibit of Catalin products displayed to the public in a window of Gimbel Brothers department store from February 23rd to March 3rd. Much interest was evinced particularly because of the recent growth, beauty of form, and utilitarian advantages which a synthetically molded product offers.



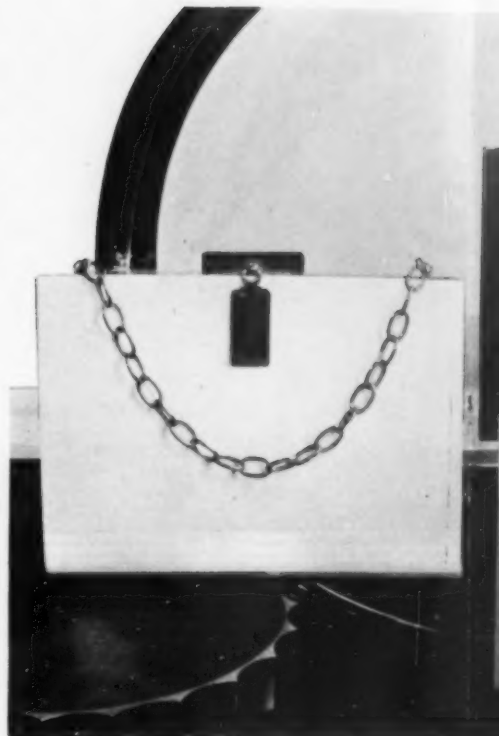
A story with a truly happy ending! Salt and pepper shakers set in a Durez base molded by Mack Molding Company for Imperial Metal Products—and guaranteed to keep the salt dry so that it does not clog and cake.



Premium offered by Corn Products Refining Company in conjunction with the sale of their product Laniol, the bath beautifier. This perfume container of Bakelite Molded is equipped with a metal cap, the center portion of which serves as a mirror. When this section is extended the perfume flask with the molded closure pops up through the opening by a spring action.

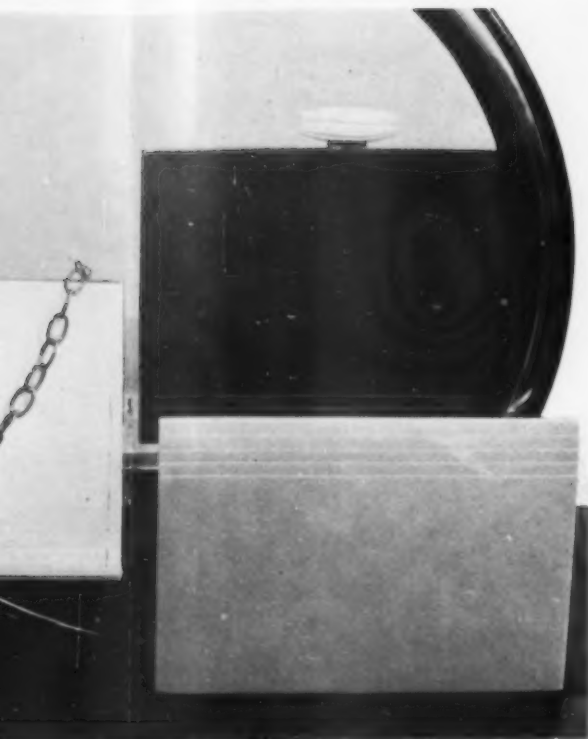


Recommend a Debutante for a debutante. Packaged in a mottled brown molded box, the razor itself has a handle of the same material, is sanitary, durable in construction, and offers an excellent idea for package and commodity.



The last word in purses and a clever adaptation of modernistic fashion, with matching linings of rayon for women who wish to be smartly attired.





ever adaptation of Pyralin in red and blue tones. Finished in linings of rayon moire, these bags should find ready favor among red.

Below, a bill-fold of leather trimmed with Pyralin, turning an ordinarily homely product into one of strong sales appeal.



Swinging doors that open uncannily upon approach are creating widespread interest in the Pennsylvania Terminal, New York City, where they have been installed. Photoelectric cells installed in the railings actuate the opening and closing of the doors. Doors are veneered with Formica, in red and black color motif, eliminating the problem of door refinishing.

Soon the only thing man will have to do for himself will be to think, and if a molded products concern can think of a way to remedy this, it will be done. Elenco, the electrically operated razor blade sharpener is another step forward to this Utopia. Simple in construction, compact, and shock-proof, this device hones and stropps the blade in one operation, and boasts a case of Bakelite Molded.



Another contrivance designed to aid man's material comfort which, while it robs him of a few peaceful moments of contemplation when filling his pipe, is the last word in perfection we should say. A molded tobacco humidor that serves as a mechanical pipe filler accomplishes this purpose. A quick twist of the knob fills the pipe bowl with tobacco compressed sufficiently to yield a perfect draft. The device provides room for cigarettes, matches, and additional pipes. Announced by Humi-Stoker Manufacturing Company.





The electrical insulating field owes much to molded plastic materials, which offer a number of advantages especially in fuse plug construction, making at once for increased safety. This one of molded phenolic provides complete insulation with great mechanical strength. It is non-shatterable under very heavy short circuits, non-vented and will not explode gases in cut-out box, panel or room. Product of the Union Insulating Company.

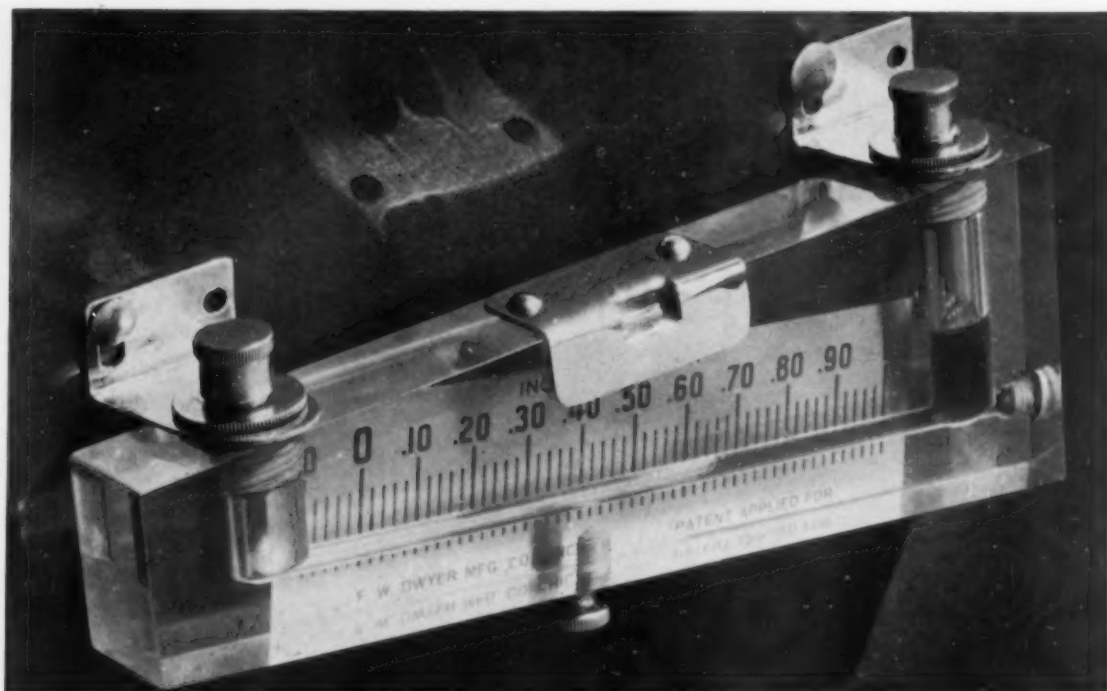


A facial massager made of Lumarith, a cellulose acetate product of Celluloid Corporation, molded by Shaw Insulator Company.



No more treks to the North Woods to inhale the fragrance of the pines for curing nasal and throat conditions, or to gain that desired relaxation of sound sleep. At a mere turn of the switch the Aromaire permeates a room with the fragrant vapors of pine oil, a device housed in a gothic Bakelite Molded cabinet.

Transparent draft gauges are fast meeting an ideal in this type of instrument. A block of Transparent Resinoid, in clear water white effect has been employed by the Dwyer Carbon Dioxide Indicator to attain this perfection. The inclined tube and oil chambers are accurately reamed in the solid casting. Since there is no metal casing, all parts are fully visible and the leveling bubble is free from shadow and easy to read.



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Synthetic Resin Bases for Finishes

RESINOUS condensation products useful as bases for varnishes or enamels can be made by condensing a polybasic acid with a polyhydric alcohol, which has been partly esterified with a monobasic acid. The partly esterified alcohol may be prepared by heating a monobasic acid or a mixture of such acids (*e.g.* acids occurring in natural resins) with excess of a polyhydric alcohol, or by the interaction (alcoholysis) of a completely esterified polyhydric alcohol with a free polyhydric alcohol. In alcoholyzing a drying oil with glycerol, however, a high temperature or a prolonged time of reaction is necessary, and although this may be obviated by using a catalyst such as calcium glycerate the reaction is still unduly prolonged; in addition to the economic drawback this has the disadvantage that polyalcohols are liable to be formed, and accordingly the products will tend to have a higher acid value and a greater liability to gel than if the alcoholysis were completed in a shorter time or at a lower temperature. It is explained in (British Patent No. 391, 508) that when a natural resin acid, such as colophony, is added to a mixture of glycerol with a fatty oil, a homogeneous product is formed on heating for a relatively short time at a reasonably low temperature. The process claimed consists, therefore, in heating together a fatty oil, colophony (more than 15 per cent. of the weight of the oil), and a polyhydric alcohol in excess of the amount needed for the esterification of the resin, until a homogeneous product is obtained, and heating this further with a polybasic acid. For example, a mixture of glycerol (17 parts), tung oil (108 parts), and colophony (100 parts) is heated at 200° C. for 45 minutes, phthalic anhydride (37 parts) is added, and the heating is continued at 200° C. for 40 minutes. The products are claimed to be clear and homogeneous.

The simple resins of the polyhydric alcohol-polybasic acid type are readily converted by heat into infusible, insoluble products, which tend to be brittle and are often not sufficiently compatible with cellulose esters for use in lacquers; the modified ester resins in which a simple monobasic acid is included have found extensive application as they possess high compatibility with cellulose derivatives. It has, however, proved difficult to produce ester resins of this type which at the same time have great strength, satisfactory hardness and light color, and are also sufficiently elastic and compatible with cellulose esters for use in the coating

industry. This problem is claimed to have been solved by a process described in U. S. Patent No. 1,864,909. Method consists in causing a polyhydric alcohol and a polybasic acid to react in presence of phthalide or a derivative or substitution product of phthalide (the lactone of hydroxymethylbenzoic acid); in many cases it is advisable to use more than one acid in the condensation, the second of these being a monocarboxylic acid. Resins prepared in this way are elastic and show satisfactory compatibility with nitrocellulose, in some cases without the use of plasticizers. They are usually soluble in the solvents, which will dissolve the unmodified resins, but by virtue of the alcoholic hydroxyl group of the phthalides their solubility is higher, and are often soluble in solvents in which the unmodified resins will not dissolve. Although, as already stated, it may not be necessary to use plasticizers with the modified resins, it is desirable in some cases to use these in reduced amounts; any of the ordinary plasticizers for this type of resin may be used, but special value is attached to phthalide itself or substituted phthalides or keto-aromatic acids, such as benzoyl- or naphthoyl-benzoic acid. Numerous examples of suitable polyhydric alcohols and polybasic and monobasic acids are given, but no specific claim is made for the use of any of these other than glycerol and phthalic anhydride. In place of the phthalide may be used its mono- or di-alkyl, aryl, or alkylidene derivatives, or hydrogenation products, such as hexahydrophthalide. In general the resins are prepared by condensing the polyhydric alcohol with insufficient of the polybasic acid to combine with all of the hydroxyl groups, adding phthalide in amount at least sufficient to combine with the unsatisfied hydroxyl groups, and completing the condensation, preferably at a higher temperature; for example, equimolecular amounts of all three components may be used. In one example 1 mol. of glycerol and 1 mol. of phthalic anhydride are heated together at 180° C. until evolution of gas ceases; 1 mol. of phthalide is added, and heating is continued at 210° C. until the product solidifies to a hard, non-sticky mass. The resulting resin is practically colorless and is converted by heating for several hours at 260° C. into an insoluble, infusible resin of excellent toughness. In its fusible state, it can readily be blended with nitrocellulose to yield a varnish which gives films of high quality even without the addition of a plasticizer; if, however, maximum flexibility is required, 5-10 per cent. (on the weight of resin) of dibutyl phthalate or ethyl benzoylbenzoate may be added. Other examples show resins in which benzoic acid, coconut oil fatty acids, or maleic acid is included (the last-named in place of the phthalic anhydride). A resin with excellent plasticizing properties is prepared from 1½ mols. of ethylene glycol, 1 mol. of

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phthalic anhydride, and 1 mol. of phthalide or hexahydrophthalide; this resin does not become infusible on heating to 260° C.

United States Patent No. 1,860,098 relates to the use of the above resins in combination with other synthetic resins such as phenol, aldehyde resin, urea resins, etc. Thus a resin prepared as described in the first example given above, but with the 1 mol. of phthalic anhydride replaced by 0.75 mol. of phthalic anhydride plus 0.5 mol. of coconut oil fatty acids, is soft and flexible, and when mixed with a polymerized vinyl resin in about equal proportions and dissolved in a suitable solvent is a useful impregnating varnish. In another example a modified resin is prepared under similar conditions, but using 1 mol. of glycerol, 1/2 mol. of phthalic anhydride, 1/2 mol. of maleic acid and 1 mol. of phthalide or phenylphthalide; the resin is mixed with 30 per cent. of its weight of zinc or aluminum benzoylbenzoate and 70 per cent. of a resin prepared from 1 mol. of glycerol, 1 mol. of phthalic anhydride, and 1 mol. of abietic acid. The mixture is dissolved in a solvent containing acetone, butyl alcohol, and about 20 per cent. of toluol; if desired, about 10 per cent. (on the weight of resin used) of diethyl or dibutyl phthalate may be added.

Modifying Resins of the Phthalic Acid Glycerol Type

Among the numerous processes suggested for modifying resins of the phthalic acid-glycerol type by the inclusion of higher fatty acids in order to render them more suitable for use in varnishes and lacquers, none has so far succeeded in giving products which yield sufficiently tough or elastic coatings, nor are these entirely waterproof. The last drawback can be overcome to some extent by using tung oil acids, but the use of these is limited by their tendency to form insoluble gels on heating. By making such modified resins in presence of either soluble phenolic resins or their components (phenols and aldehydes or ketones), highly flexible, waterproof resins can be obtained (United States Patents Nos. 1,867,583/4. The amount of phenolic resin or total of its components should not exceed about 50 per cent. of the weight of the resin mixture, otherwise the resulting varnish films are liable to be dull and spotty. The polyhydric alcohol, polybasic acid, and monobasic acid components are those usually employed in making modified resins of this class. The soluble phenolic resins may be prepared by heating together equimolecular proportions of cresylic acid and paraldehyde until the primary condensation product is formed, and freeing this from excess of cresylic acid a mixture of 10 parts of this cresol alcohol, 45 parts of phthalic anhydride, 22 parts of glycerol, and 23 parts of linseed oil acids is heated at about 250° C., preferably in an inert atmosphere, until it has attained the desired toughness (this point occurs shortly before the mass passes into the insoluble form), and the product is cooled rapidly either by pouring into a chilled receiver or by diluting with the appropriate varnish solvent. If castor oil acids are used instead of those of linseed oil, a resin suitable for use in lacquers is obtained. In the alternative method of carrying out the process, the 10 parts of soluble phenolic resin (cresol alcohol) are replaced by 7.7 parts of cresylic acid and 2.3 parts of paraldehyde and the heating and subsequent treatment is carried out as described above; the reaction in this case is, however, sufficiently slow for satisfactory control, since the resin has no great tendency to gel abruptly after it has reached the desired stage. The product is soluble in low-boiling solvents and is useful in lacquer mixings.

Combinations of polyhydric alcohol-polybasic acid resins with drying oils have usually been prepared by incorporating the resin with the oil by means of a solvent. U. S. Patent No. 1,888,849 tells of a method of preparing such complexes without the use of a separate solvent, by utilizing one of the ingredients (e.g., the phthalic anhydride) as solvent for the oil. For example, 70 parts of linseed oil are added to about 200 parts of molten phthalic anhydride, and the mixture is heated until the ingredients have become thoroughly intermixed; about 90 parts of glycerol are then added, and the mass heated gradually to 250° C. The product is a brownish resin soluble in the usual organic solvents

(benzol-alcohol, acetone, etc.), giving a solution which may be caused to dry in air or set by heating at 125° to 150° C. Similar homogeneous complexes may be prepared by dissolving linseed oil or other drying oil in other organic acids, such as camphoric, naphthalic, benzoic, or malonic acid.

Further Processes for Heat-hardening Resins

Another series of processes for producing combinations of heat-hardening resins with non-resinous aliphatic acid esters is described in United States Patent No. 1,893,874. In general the process consists in dispersing one of the components in the other to give a product having physical properties differing from those of the components. The resinous material and the oil may be combined by heating the components together in presence of a high-boiling liquid, preferably one which permits heating in ordinary containers to about 200° C. For example, a condensation product of glycerol and phthalic anhydride may be incorporated with a drying oil such as China wood oil by heating these together in any proportions (but preferably equal parts), in presence of benzyl benzoate, gradually to about 200° C.; the wood oil gel which forms at first becomes gradually dispersed in the solvent together with the resin. When the solvent is removed, a sticky, viscous mass remains. Other solvents which have given good results are benzyl acetate, nitrobenzene, toluidine, benzyl alcohol, cresol, rosin, aniline, coumarone, diphenyl, glycol diacetate, phenylhydrazine, and *o*-tolyl benzoate. If it is desired to combine the oil and resin in presence of a low-boiling solvent, such as benzyl acetate, the components may be heated together under a reflux condenser in order to avoid loss of solvent. Resins such as those made by the interaction of shellac and tannic acid may be combined with oils by this process. In a modification of the invention a drying oil may be converted into a degelled condition before incorporating it with the resinous material. For example, linseed oil is heated at 300° C. until it has been converted into the gel state, and then submitted to further heating at 200° to 300° C. until it has again become liquefied. The product may be combined with glycerol-phthalic anhydride resins, e.g., by heating equal parts together in an autoclave until blended; in this case no dispensing agent is required, since the degelled oil acts as dispersing medium. Again, if the resin in its initial fusible condition is heated with the oil in an autoclave or under a reflux condenser, dispersion occurs under the influence of the decomposition products or other volatile matter evolved during the heating. Further, it is not necessary to use the resin in its initial soluble stage. The glycerol, phthalic anhydride, and oil may be heated together to a high temperature to effect reaction, or the resin in its final insoluble condition may be heated with an oil to a high temperature in presence of a high-boiling solvent; in this case the resin is broken down by the action of the solvent and the oil, and the decomposition products effect the desired dispersion. The materials prepared in this way differ from the components in solubility; thus, whereas glycerol-phthalic anhydride resins are substantially insoluble in benzol and carbon disulfide, the dispersions of resin and oil are soluble in these, but insoluble in ethyl alcohol. Solutions of the resin-oil complexes yield tough, adherent, flexible films which when set are infusible and insoluble; they are highly resistant to oil and will withstand higher temperatures than ordinary varnish films. Processes similar to the above may also be used for blending oils with resins, such as Kauri gum, with which the oils are incorporated with difficulty by ordinary methods. Another method of producing combinations of polyhydric alcohol-polybasic acid resins with drying oils, is described in United States Patent No. 1,889,923. It proposes treating an oxidizable unsaturated fatty acid with excess of glycerol to form a monoglyceride, blending with a drying oil, and then combining the remaining free hydroxyl groups with a polybasic acid; a further amount of drying oil may be incorporated in the product. The oxidizable unsaturated fatty acid may be a drying oil or its mixed fatty acids, or an acid such as oleostearic, linoleic, or linolenic. For example 100 grams of the fatty acids of linseed



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oil and 92 grams of glycerol are heated together at 200° to 250° C. until they are completely blended; 392 grams of linseed oil are added, with stirring until a clear solution is obtained. After the addition of 200 grams of phthalic anhydride heating is continued until a sample of the product loses all fluidity in less than five minutes on a hot plate at 200° C. In some cases about one quarter of the total amount of linseed oil may be added where indicated, and the remainder after the reaction with phthalic anhydride; in this way it is possible to add practically any amount of oil after the initial mixture of resin and oil has been prepared. When the fatty acid content of the mixed resin amounts to about 45 per cent. it is easy to incorporate the resin with the drying oil to produce a stable mixture of simple heating. With smaller percentages of fatty acid in the resin, however, the resin, though miscible with the oil while hot, tends to separate out on standing. If the part of the drying oil is incorporated with the resin during its manufacture, as described above, a loose combination of oil and resin appears to be formed, so that separation of the components does not occur. The resin-oil compositions prepared as above are soluble in most organic solvents, and if the resins have a high fatty acid content they will dissolve in petroleum solvents. The products are of value as varnishes, enamels, and similar compositions, yielding highly adherent, flexible coatings.

The intermediate products formed by the condensation of polybasic acids or their anhydrides with polyhydric alcohols are always acidic, but the acidity decreases as the polymerization process continues, although it still persists to some extent in the final plastic state. This acidity is detrimental in products to be used for lacquers or for impregnating fabrics, owing to the destructive action on the base. In British Patent No. 389,852, it proposes to neutralize the condensation product in its intermediate stage either with concentrated ammonia solution or with ammonia gas; when the product of this treatment is heated ammonia will be liberated by the further condensation, but no acid reaction will occur at any stage of the process, and the final product will be completely neutral. The use of concentrated solution of ammonia or the gas in place of dilute alkali (which has previously been suggested), reduces the danger of hydrolysis occurring. As an example of the process, 1 kg. of adipic acid is heated with 0.52 kg. of 80 per cent. glycerin at 160° to 170° C. for several hours, the acidity is neutralized by means of concentrated ammonia solutions, and heating is continued at 150° to 180° C. for a few hours, or at 80° to 100° C. for several days, to form the final neutral plastic. The neutralized intermediate product may be applied to metals by coating, used for impregnating fabrics, or cast in molds and the resin converted into its final state by the appropriate heating.

Polyhydric Alcohol-polybasic Acid Resins

Some interesting observations on polyhydric alcohol-polybasic acid resins are noted in United States Patent No. 1,890,668. Inventor states that the members of this group of resins are generally regarded as equivalent for use in lacquers or other coating compositions. He has found, however, that although some of the resins of this group are useful with nitrocellulose and similar substances, in other cases their use actually decreases the durability and toughness which is a property of the nitrocellulose. Also, many of these resinous esters are insoluble in the common solvents, such as toluene. To produce such resins which are freely soluble in the usual pyroxylin lacquer solvents and diluents, and also are freely miscible and compatible with nitrocellulose in all proportions and capable of protecting it against weathering effects, it is proposed to condense a polybasic acid with a simple dihydric alcohol or glycol containing more than two carbon atoms; these glycols have the general formula $R(OH)_2$, where R is a straight carbon chain of three or more carbon atoms, and therefore do not include diethylene glycol and similar ether alcohols. Thus a resin prepared by heating 76 parts of $\alpha\beta$ -propylene glycol, $OH.CH_2.CH(OH).CH_3$, with 148 parts of phthalic

anhydride to a maximum temperature of 290° C. in a partly closed vessel for about 2½ hours is compatible with nitrocellulose, and is soluble in butyl or amyl acetate or butyl propionate, but not soluble in toluene alone; solutions of the resin in the above solvents may, however, be diluted with toluene. Resins prepared from equivalent amounts of ethylene or diethylene glycol are soluble in ethyl acetate, but not in toluene or butyl acetate. In general, the resins from glycols with three or more carbon atoms, unlike those from glycerol, are not capable of being converted by heat into insoluble and infusible substances. The resins become progressively softer and more soluble with increasing number of carbon atoms in the glycol. Similar resins are obtained by replacing the phthalic anhydride by succinic, malic, maleic, citric, or tartaric acid, and a fatty oil or oil fatty acids or a natural resin may be included in the reaction mixture. Examples of lacquers include (1) the resin prepared as above from butylene glycol 2 parts, low-viscosity nitrocellulose 1 part, normal butyl acetate 4 parts, toluene 4 parts; (2) resin from $\alpha\beta$ -propylene glycol 4 parts, low-viscosity nitrocellulose 1 part, normal butyl acetate 30 parts, normal butyl alcohol 10 parts, toluene 20 parts by weight.—Abstracted from *Synthetic and Applied Finishes*.

Cellulose Lacquers and Components

Certain pigments in coating compositions are apt to form a hard cake which cannot be dispersed by mixing. This is particularly undesirable in low-viscosity lacquer type products, i. e., brushing lacquers, and it occurs often in combinations of high-density pigments or pigments with abnormal caking tendency, and low-viscosity nitrocellulose vehicles. U. S. Patent 1,863,834 covers a process of preventing this objectionable feature. By providing the pigment particles with a coating of rubber, or the like, they are prevented from adhering together. The protective agents which may be used with nitrocellulose lacquers include: rubber latex and sodium caseinate in water medium, rubber (milled or raw) in gasoline or benzene medium; citric, tartaric, or propionic acid, or gelatin, with glycerin, in alcohol-toluol medium; stearine pitch in naphtha or gasoline medium; balata, silver stearate, tannic acid, or gutta percha hydrocarbon, in a gasoline medium. In the case of oil and varnish media the following may be employed; rubber latex, pectin, sulfonated castor oil partly neutralized with ammonia, and Turkey-red oil in water medium; rubber or pectin in gasoline medium; sulfonated oils, fats, or petroleum fractions dissolved in gasoline or in the paint vehicle; or colloidal wax in gasoline medium (e.g., carnauba 1.6, paraffin 7.9, gasoline 90.5 per cent.). For compositions to be used as undercoats for metal, such as modified glyptal resin vehicles, rubber or stearine pitch dispersed in gasoline-naphtha medium may be used as protective agent. The process is applicable to a variety of pigments such as Titanox, lithopone, titanium oxide, iron oxide, barium sulfate, chrome green, whiting, basic carbonate white lead, etc. A method of preparing such non-caking cellulose lacquers, which constitutes one of the claims of the invention, consists of grinding a mixture of the pigment and rubber solution with a solvent mixture and a gum, and adding this to a cellulosic material mixed with an ester, a gum, and a solvent, the mixture being adjusted to brushing viscosity by addition of a solvent. For example, 55 parts of Titanox are ground in a pebble mill for 12 hours with a mixture of 5 per cent. solution of rubber in gasoline 11 parts, ethyl alcohol 6.1 parts, butyl acetate 1.3 parts, toluol 2.3 parts, gum dammar 6.1 parts, and the mixture is added to a combination of butyl acetate 16, ethylene glycol ethyl ether 10, butyl alcohol 10, ethyl alcohol 7.9, gasoline 3.4, toluol 4.2, gum dammar 3.9, half-second nitrocellulose 10, dibutyl phthalate 4 parts (all by weight). If desired, the pigment may be incorporated with the protective agent (rubber) by dry-milling without the use of a solvent or diluent, and the mass then mixed with the other constituents.

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Modern Casein Paints*

By F. C. Atwood

Atlantic Research Associates, Inc.

THE idea of protection and permanency as a reason for painting has been overemphasized and the emphasis misplaced. It is all right to stress the need of paint on metal and wooden surfaces as a means of protection but it has been shown that on modern buildings there are one hundred gallons of paint used on interior surfaces for each single gallon used for exterior work. Interior paint is used primarily for decoration and not for protection. Most interior surfaces are plaster or masonry of some kind. Casein paints are highly suitable for the decoration of such surfaces.

Several years ago I estimated, from generally available figures, that the normal yearly average of construction for this country was 750 million square feet of floor area. We have recently been much below this but should reach it again. In the period I was studying, residential construction covered 55 per cent. of this amount, public buildings 6 per cent., commercial and industrial nearly 30 per cent. and the remaining 10 per cent. was for educational and institutional. For several years to come now the public building will be a big factor, while commercial and industrial are overbuilt. Residential construction should soon assume great importance. A study of all this construction will show that something like 65 to 75 per cent. of the paintable areas will call for decorative paint only.

Areas painted for protection are considered satisfactory so long as the paint is in good condition. Decoration is another matter. We live with it intimately and we need and demand change of atmosphere in our surroundings. If we don't furnish this change with paint and new styles of paint, then some other material may replace our paint. Consider paint good for four years from this angle and with an average building life of forty years we have potentially from 25 to 30 billion feet of paintable construction area each year—an amount well worth considerable study in order that it may be well and pleasingly painted for decorative purposes. Much of this area has been and still is decorated with wall paper. Much of it is unpainted. There have been so many difficulties involved in redecoration that paint has frequently not been considered for such work. Modern casein paints offer the decorator and master painter an opportunity to get a great many jobs that have been withheld from him before. If you will but stress the ease and simplicity of decorating with casein paints, your gross sale for each job may be less but net profit as well as the greater number of jobs available will multiply rapidly.

Paint in its basic form means opaque coloring matter or pigment. To paint is to cover or coat a surface with this pigment. The simplest paint is a pigment applied to a wet surface which will hold this color when the surface is dry. Some of the most permanent of all paint jobs are of this type, commonly called fresco work. Waxes, gums, albumens, asphalts, milk and then oil were used in early times more or less in the order named as means for binding this colored pigment. Paint, therefore, has come to mean a composition of matter composed of a pigment and a vehicle. If the vehicle is liquid thinning may be necessary to make it easy to apply to the surface to be decorated. If the

vehicle is solid it needs to be thinned for application by dissolving in a suitable liquid. This thinner, or solvent, forms no part of the finished surface and is useful and necessary only for the practical purposes of application. The practical thinner has always been the one which would do the job satisfactorily at lowest cost.

Water has always been the most universal solvent and thinner available for use in paint. It can be considered an adulterant and fraudulently used when it does not naturally adapt itself for the use to which it is put and when it does not yield as good a paint film as some more suitable thinner. Water was the only thinner used until asphalts, oils and certain gums came into use. Custom and habit, together with the lack of other suitable thinners, made turpentine a thinner of great importance for many years. Since petroleum distillation is more accurately controlled, mineral spirits and naphthas have been adopted and successfully used as thinners with oil and oleoresinous paints. Nitrocellulose, shellac, cellulose acetate, the newer types of synthetic gums and other materials which may properly be termed paint vehicles all require their own special solvents and thinners. Paints using these various thinners are not called turpentine paints, alcohol paints, gasoline paints, and benzol paints. Such terminology does not describe the paint but tells only of the simplest and cheapest means of applying that paint.

Water is used in paints not as a vehicle itself but because it is the most suitable solvent and thinner for a number of paint vehicles. Shellac is usually dissolved with alcohol. The manufacturer of shoe dressings more often dissolves shellac in water. Therefore, the term Water Paints which has grown up in the paint trade does not express any real fact nor have a truly significant meaning. More than that, those black sheep in the paint industry who have used water where it should not be used have caused water thinned paint to bear some relation in the trade mind to poor, cheap, substitute and makeshift materials. My suggestion is that we forget the name water paints and adopt some name more representative of a whole group of paints which use water as their thinner but do not hold the water as part of the final film of paint.

Calcimine very properly refers to a paint containing a high percentage of whiting as a pigment. Whiting is chalk or calcium carbonate, both names being derived from the Latin root "calc". The vehicle commonly used with the whiting is glue, starch, or other material readily softened by water so the calcimine can be easily removed. Unfortunately we have, for years, known paints made with whiting and casein as cold water paints. I would prefer to class them as washable calcimines, particularly since the agent which renders them washable is lime. This will leave us free to call paints made from casein and strong coloring or high hiding pigments as casein paints. These may be sold in dry powder, paste or liquid form. We can easily call them casein powder, casein paste or casein liquid paint. If oil is blended with the casein, we naturally call this compound an oleocasein paint. Cement paints are naturally made with some form of hydraulic cement and are properly named. Plastic or texture paints indicate their own particular function and field.

This group of coating materials are now all associated because the one fact they have in common is the use of water as a solvent and thinner. In the same way lacquer manufacturers are joined by their common use of spirit solvents and thinners. Water paint is not a proper nor correct term to use for this common association since it refers only to the thinner, not to the character of the vehicle. I believe the word Distemper used in the broad European sense will adequately cover all paints and coating materials using water as a thinner and solvent. For specific items we should adhere to special definitions, i.e., calcimine, washable calcimine, casein oleocasein, texture and cement paints. This leaves the field open for any other water thinned vehicles to be included as a Distemper since distemper is defined in many dictionaries as "a pigment mixed with a vehicle soluble in water."

Now that these definitions are out of the way I hope it is clear that casein paints should refer to a paint made from the best quality and highest strength pigments using casein as the vehicle.

*Abstract of address before International Society of Master Painters and Decorators.

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From abietic acid to xylol, the properties and uses of 492 solvents have been compiled in tabular form by the Staff of the Laboratories of Dr. William M. Grosvenor, and beginning with April will be published in the next five issues of **PLASTIC PRODUCTS**, four pages per installment.

These tables show the names and the trade names; the empirical formula; whether the material has the properties of a solvent, a solvent softener, a non-solvent softener, a plasticizer or a diluent; its melting or solidifying point; its boiling point and its flash point; its vapor pressure and the critical temperatures and pressures; viscosity centipoises; its latent heats of fusion and vaporization and its specific heat; its capillary constant; refractive index, and surface tension—in a word, the most complete compilation of the essential facts, figures, properties and uses of the greatest number of solvents collected in one space. After complete publication, the series will be reprinted as a supplement, with a complete index, and sent free to all paid subscribers to this magazine.

Send in your subscription today. Three dollars a year, for twelve copies of the only American magazine devoted wholly to plastics, synthetic resins, coatings, etc., with a copy of the new 1934 **PLASTICS GUIDE-BOOK** and the Grosvenor Table of Solvents.

Plastic Products

25 Spruce St.

New York

Plastics and Coating News

Final Packaging Exposition Plans Announced — Labor Protests "Merit Clause" in Chemical Alliance Code — Monsanto Petroleum Chemicals Organized — Synthetic Resin Manufacturers' Association Formed — American Catalin Moves — Darlington Resigns From Hercules.

With the number of exhibitors and entries running well ahead of the same period last year, indications are that all records will be broken by the Fourth Packaging Exposition and the Third Irwin D. Wolf Award, to be held at the Hotel Astor from March 13 to 16, inclusive, under the sponsorship of the American Management Association. Present indications are that more than 300 packages will be entered in the competition. To clear up a misunderstanding among a number of companies, the management of the Packaging Exposition and the Wolf Award has issued the following statement:

"While actual packages entered in competition for the Wolf Award are not to be sent to the Hotel Astor until the period from Feb. 26 to March 8, inclusive, entry blanks, filled in, are now being received by the Wolf Award Administration, 232 Madison ave., N. Y. City, and all companies planning to enter packages in the competition should send in their entry forms as early as possible to this address. A few companies have erroneously assumed that entry forms are not to be submitted until Feb. 26. This, however, applies only to the entries themselves and not to the entry forms."

Purpose of the Wolf Award competition is "to stimulate constructive interest in the application of art to the improvement of packages used in the marketing of commercial products; to arouse creative interest in manufacturers of packages; and to develop in designers the practical adaptation of the artistic to the useful in the packaging field."

Public To Be Admitted

In order to extend the scope and usefulness of the event, arrangements have been made to admit the public to view the packages, although the exposition itself will continue to be confined to the trade. Plans are now under way to make possible showings of the Wolf Award packages in later special exhibitions throughout the country.

All indications are that the Packaging Exposition this year will set a new high mark for size and attendance. With all space in the main hall contracted for, the

Exposition Management has thrown open 2 additional rooms, with 36 booths in all. Twelve of these booths had been taken by exhibitors within 10 days after the space had been made available.

Clinic Plans

Plans for the conferences and clinics on packaging, packing and shipping, to be held concurrently with the Packaging Exposition and the Wolf Award exhibition, are rapidly being whipped into final shape, according to John G. Goetz, managing director of the American Management Association. Both clinics and conferences, it was stated by Mr. Goetz, will place emphasis this year on the promotional aspects of packaging, and a brilliant list of speakers and experts will highlight the sessions.

First reports received from exhibitors establish clearly that significant strides have been made in the province of packaging during the past year. A brief record of some of the items to be shown by various exhibitors in the plastics field follows:

General Plastics: Latest Durez caps for food and liquor and drug and cosmetic packages, molded cosmetic jars, boxes, display stands and miscellaneous items such as trays, compacts, dispensing units, lipstick holders, etc.

Du Pont Cellophane Co.: Cellophane in all its applications.

COMING EVENTS

National Wine & Liquor Show, Chicago, March 5-9.

American Management Association, 4th Annual Packaging Exposition, Hotel Astor, N. Y. City, March 13-17.

Fashion Group, "Fashions and Interior Decorations Developed in Man-Made Materials, 30 Rockefeller Plaza, Rockefeller Center, March 15-April 14.

A. C. S. 87th Meeting, St. Petersburg, Fla., Hotel Vinoy Park, week of March 25.

Industrial Arts Exposition, National Alliance of Art & Industry, 30 Rockefeller Plaza, Rockefeller Center, April 1-30.

Fourth Annual National Premium Exposition and Convention, Palmer House, Chicago, May 7-11. A. B. Coffman, Exp. Mgr., 35 East Wacker Drive, Chicago.

Armstrong Cork & Insulation Co.: Complete line of Armstrong's closures for products of all types put up in either bottles or jars. These closures include corks, molded caps and jar covers, metal caps and jar covers, crown caps for beverage bottles, embossed top corks, liners for caps and miscellaneous types of seals.

Sylvania Industrial Corp.: Will display Sylphrap (transparent wrapping material) in rolls, sheets, etc. Packages wrapped in Sylphrap. Booklets, leaflets and advertising material on Sylphrap.

Bakelite Corp.: Wide range of packages and display devices embodying Bakelite materials in their construction. Molded closures such as bottle caps and jar covers, powder boxes, cream jars, dual use packages, in various colors. Laminated display stands in color and in black, with decorative metal inlays and the Revolite flexible, water-proof cloth processed with Bakelite Resinoid.

Celluloid Corp.: Printed and plain samples of Protectoid transparent wrapping paper. Packages wrapped in Protectoid. Plain and printed cartons and envelopes with Protectoid windows. Hot plate to demonstrate heat sealing Protectoid.

Toledo Synthetic Products Co., of Toledo, Ohio, is also planning on a very complete exhibit of the latest uses of "Plaskon" in the broad field of packaging and will have a large delegation at the Astor during the exposition week.

Alliance Code Signed

After months of feverish activity the basic code of the chemical industry (The Chemical Alliance Code) was finally signed by President Roosevelt on Feb. 10 after NRA approval by General Johnson on Feb. 2.

Labor circles in Washington and the labor advisory board immediately entered strong protest with NRA because of the inclusion of the much debated and controversial so-called "Merit Clause" although the wording had been altered very considerably in the draft from the original clause finally given official sanction. Opponents of the clause pointed to an earlier statement of Administrator Johnson in which he stated that granting inclusion of the clause in the automobile code had been a mistake and would not be permitted in any other codes. On Feb. 17 General Johnson issued the following statement in reference to the Chemical Code: As this Code was reported originally by former Division Administrator Williams it contained the so-called "merit clause." I returned it to the Division in order to have

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Here is a new book explaining in detail how plastic materials are molded. Constitutes a complete, practical manual of up-to-date information needed both by the user and manufacturer of plastic products.

Plastic Molding

by LOUIS F. RAHM

Assistant Professor of Mechanical Engineering, Princeton University

246 pages, 6 x 9, illustrated, \$3.00

THIS book describes the molding process and the characteristics of plastic materials. It takes up in detail the types and uses of molds, their style, general design details, the hobbing process. Then it gives definite information on operating equipment and discusses the selection of equipment and the layout of the molding plant. It includes careful suggestions on maintenance and operation of equipment.

If you are a manufacturer, you will get from this book help on all sorts of plastic molding problems. You will secure a manual of best methods.

If you are a user of plastic products, you will get from this book priceless suggestions for the more efficient selection and adaptation of these products.

The author has had wide practical experience through his connection with the Du Pont Viscoloid Company and the Burroughs Company. Under the Robert Stewart Brooks Fellowship at Princeton, he made a survey of the methods and equipment of the leading molding plants in the country. His book is an authoritative manual for the entire plastic molding industry—the first to be devoted exclusively to molding processes, equipment and methods.

CONTENTS: I—The Molding Process and the Plastics. The Molding Process. The Plastics. II—Molds. Types and Uses. Style. General Design Details. Special Details. Die Hobbing. III—Operating Equipment. Molding Presses. Accessory Equipment. IV—The Molding Plant. Plant Equipment.

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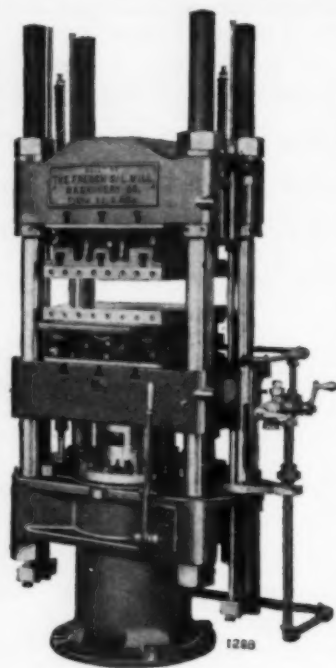
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this clause eliminated. Subsequently a report was made by Division Administrator Berry that the merit clause had been eliminated and that Article IX in its present form does not violate the established policy of the Administration. Apparently through error of transcription or interpretation, the Code as resubmitted by Major Berry under the above report is still objectionable and Article IX violates the established policy. Therefore, it will be eliminated.

Monsanto Further Expands

Monsanto Petroleum Chemicals, Inc., Dayton, Ohio, has been organized as an affiliate of Monsanto Chemical, St. Louis, and the Thomas & Hochwalt Laboratories, Inc., Dayton, to develop the production of synthetic resins, alcohols and aromatic chemicals from petroleum.

New company will take over the plant and processes of the Dayton Synthetic Chemicals, Inc., which was formed about 4 years ago as a subsidiary of Thomas & Hochwalt to exploit the manufacture and use of petroleum base resins developed through the researches of the laboratories. The officers of the new company are Edgar M. Queeny, president, and Charles Allen Thomas, vice president in charge of operations.

All of the research work of the new company will be performed in the laboratories of Thomas & Hochwalt, which will also continue its usual activities as an independent organization in the field of industrial chemical research.

A.S.T.M. Notes

A.S.T.M. has published tentative specifications on spirits of turpentine, wood to be used in panels in accelerated weather tests of paints and varnishes, shellac varnish, centrifuged shellac varnish, 90% benzol, tricresyl phosphate, industrial xylol, and soluble nitrocellulose base solutions. Copies are obtainable at 25c each from association headquarters, 260 S. Broad st., Philadelphia. All those interested are invited to make criticisms or suggestions before the specifications are definitely adopted.

Foreign Camphor

Punjab Ministry of Industry reports synthetic camphor project under way. Japanese exports of camphor are showing expansion, quantity during 1st half of this year being 15,492,000 kin, after 12,406,000 kin of Jan.-June, '32. Values of these exports were 2,494,538 yen and 1,780,227 yen respectively. Quantity to U. K. dropped from 807,000 kin to 719,000 kin, but trade with Germany increased from 34,000 to 84,000 kin. France also increased takings from 502,000 kin to 1,362,000 kin,—and British India from 2,128,000 kin to 4,297,000 kin. U. S., however, remains largest individual mar-

ket, taking 5,590,000 kin in 1st half of this year.

Spanish reports state that a new attempt will be made to establish a synthetic camphor industry. Old attempt was at Santander based on a new etherification process which proved unsuccessful. New attempt will be based on the Schering process. Recent tests of Spanish turpentine by the Spanish Institute of Forestal Research are said to disapprove belief that it did not lead to high yields of synthetic camphor.

Coatings

Synthetic Resin Manufacturers' Association has been formed with R. M. Banks, Cyanamid, as president, Gordon Brown, Bakelite, as vice-president, and A. J. Wittenberg, Stroock & Wittenberg, as secretary and treasurer. Association has not been formed for code purposes but to aid in establishing standards and other constructive work in the varnish resin industry.

Coatings December Sales

December sales of paint, varnish and lacquer products declined but little from those of November and were the heaviest for any December since 1930. Year's sales, it was brought out, were, about 10% above those of '32 and approximately 20% under those of '31. Reports from 586 establishments showed December sales amounting to \$16,156,062 against \$16,234,234 in November. In '32 December total was \$9,484,520 against \$12,492,818 the preceding month, and in '31, it was \$13,486,066 against \$16,492,187.

For the year, the reporting firms showed sales of \$222,760,965, as compared with \$203,323,315 in '32 and \$278,442,170 in '31.

A 25% improvement in volume sales of lacquer, thinners and dopes in '33, bringing the trade to within 10% of the '31 level, is reported by the bureau. Total sales for the year in value, however, showed a gain of only 16% over '32 and remained some 20% under '31.

Reports from 102 manufacturers showed sales last year of 20,901,290 gals. valued at \$28,488,154 against 16,252,821 gals. valued at \$24,338,226 the preceding year and 22,436,315 gals. valued at \$36,336,023 in '31.

Sales of finished lacquer last year, were 10,645,676 gals. valued at \$19,831,329 against 8,201,418 gals. valued at \$16,634,284 in '32 and 11,181,609 gals. valued at \$24,727,283 in '31, while sales of thinners totaled 9,260,216 gals. valued at \$7,472,393 against 7,230,383 gals. valued at \$6,566,743 the year before and 10,271,105 gals. valued at \$9,999,696 2 years earlier, and sales of dopes were 995,398 gals.

valued at \$1,184,432 against 821,020 gals. valued at \$1,137,199 in '32 and 983,601 gals. valued at \$1,609,044 in '31.

An increase of approximately 15% in the value of paint industry exports last year as compared with '32, indicating a reversal of the downward trend of the depression period, is shown by figures just compiled by the chemical division of the Department of Commerce. In dollars and quantity, improvement translated into a gain of nearly \$450,000 and 440,000 gals. in the 4 chief divisions of paint and allied exports.

Foreign shipments of ready-mixed paints, stains and enamels, it was shown, totaled 1,201,930 gals. valued at \$2,147,071 last year against 1,044,575 gals. valued at \$2,015,078 in '32, while exports of pigmented nitrocellulose lacquers totaled 336,769 gals. valued at \$813,443 against 225,546 gals. valued at \$603,574; thinners of nitrocellulose lacquers, 318,145 gals. valued at \$281,145 against 205,427 gals. valued at \$219,571, and varnishes and driers, 352,663 gals. valued at \$390,837 against 292,922 gals. valued at \$339,150.

Shellac and Pressure

Recent bulletin issued in India reports research has unearthed interesting details of the retarding effect which pressure has on the time of heating required to cure shellac. A rough classification of substances causing variation in the time of curing has also been attempted. Alkalies and solvents possess retarding influences, while accelerators include acids, ester-forming catalysts, and ammonia and ammonia liberating substances. Research on wax-free shellac points out that in some industries wax is undesirable and is filtered off before use, while others, i. e. the gramophone record industry, insist on the presence of a certain amount of wax. Comparison of the properties of varnishes prepared from shellac, with and without filtration of wax, was made. The wax-free film was clearer and more attractive in appearance, less hygroscopic than ordinary shellac, and had as much resistance to ordinary wear and weathering. However, it lacked mechanical strength, chiefly elasticity, which implied that the function of the wax present in shellac is that of a fairly good plasticizer. These facts would serve to support the fact that a wax-free film or one with a low percentage of wax is preferable wherever backing is practicable, i. e. in the electrical industry. The concluding suggestion is that in cases where the advantages of a wax-free shellac are wanted but baking is impractical, it may be possible to substitute suitable plasticizers for the natural wax.

Company News

Smith Chemical & Color (manufacturers, importers, exporters of dry colors and mineral fillers) has removed its main office from 28 Moore st., N. Y. City, to

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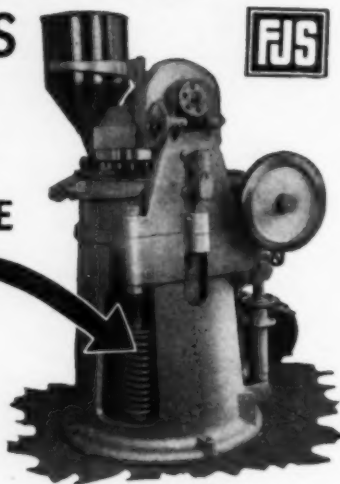
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BARCLAY 7-0600

larger quarters at 55 John st., foot of Jay st., Brooklyn. New telephone is Cumberland 6-0567.

Continental Lacquer has leased a warehouse at 511 South Sharp st., Baltimore.

Beck, Koller is now marketing a new line of chemically treated or processed fossil copal gums under the trade-mark "Kopal."

Miscellaneous

A.S.T.M. Committee D-1 on Preservative Coatings will meet in St. Petersburg, Fla., on March 26. This is the week of the A. C. S. gathering.

Forty-five tons of cellulose lacquer for use on airplane fabric has been supplied by a British firm to the Turkish Government. The market had previously been held by France.

New Haven is reported as planning 50 new coaches. Cars will be designed by Walter Dorwin Teague, who plans to use bright colors and modern decoration to lure prospective patrons.

Labor Advisory Board of the NRA has announced appointment of James C. Taylor and Solomon Barkin as labor advisers for hearings on the paint, varnish and lacquer industry codes.

Rudolf Neuberger, merchandizing executive of Zapon, subsidiary of Atlas Power, recently addressed the manufacturers council of the Chamber of Commerce of Trenton, N. J. at a dinner at the Carteret Club. Mr. Neuberger spoke on "Money and Prices."

Baltimore Production Club discussed synthetic resins on Feb. 5.

Laboratory tests carried out by the Estonian shale oil industry show that by using the phenolic constituents of shale oils it is possible to obtain resins which are practically transparent, non brittle, and which are resistant to high temperatures. —*Chemistry & Industry (British)*.

Paris Report

Du Pont Paris Style Service Office reports plastic materials are finding a more prominent use every day in field of boudoir ornaments and accessories. For table decoration, centerpieces composed of plastic flowers in different colors or in just one striking combination are used not only with modern china and glassware but even with antique china and silver. Little menu holders, knife supporters and individual salt cellars are often in a combination of glass and Pyralin or crystal. Little trees with flowers of plastic material set on a base of the same material in the form of a solid rock are used by all the leading interior decorators as boudoir ornaments. These small trees, which often show exotic flowers, Japanese cherry blossoms or the like, are also disposed in the interior of novel bird cages designed by Marie

Chauvel, which are enjoying an enormous vogue at the present time.

Aquariums, which are very popular as an interior decoration at present, have also a wide use for plastic ornaments such as seaweeds, coral, rocks, shells of all sorts, eccentric fish and so forth. Very large flowers of the plastic material, especially in gold and transparent colors, are used for display in large jet black vases in spheric shape.

Molded

Watertown Elects

Watertown Manufacturing has elected J. R. Neill, former general manager, as president and treasurer. G. E. Moseley, assistant treasurer, is now also secretary. C. B. Buckingham is in the South on company business.

General Plastics

Durez Molder, newsy monthly of General Plastics, indicates in more ways than one that the plastics industry will benefit by the end of prohibition. Bottle caps seems to be the opening wedge.

General Plastics Closure News for February discloses the names of an impressive list of companies turning to molded Durez caps.

General Plastics will have a large delegation in attendance at its booth (No. 118) at the Fourth Packaging Exposition. Those who plan to be there include H. S. Spencer, F. A. Morlock, F. E. Brill, Harry M. Dent, C. F. Landsheft, A. W. Hammer Jr., and R. M. Crawford.

Good News!

Solvent News (novel advertising insert of United States Industrial Alcohol Co. appearing in CHEMICAL INDUSTRIES and other trade journals) reports that the '33 output of phenolic resins almost equaled the record production of '29 while urea resins gained 100% in volume over '32.

Personal

Beck, Koller's vice-president in charge of technical development, Dr. William Krumbhaar, spoke before 70 members of the Chicago Paint and Varnish Production Club on Feb. 5 on the processing of fossil copal gums and pointed out the advantages of using the chemically treated product. Dr. Krumbhaar spoke before the Detroit club on Feb. 13 on the same general subject.

James L. Rodgers, Jr., president, Toledo Synthetic Products, ("Plaskon"), sailed early in February with Mrs. Rodgers for a 3 weeks stay in Bermuda.

J. F. Geers, president, Index Machinery, sailed Feb. 22 to visit the Leipzig Fair. While abroad Mr. Geers will visit several continental countries and England to study first hand what is new and novel in the plastic molding field.

Mrs. Percy C. Bowen, mother of Percy P. Bowen, (Becker-Moore & Co., wood flour producers, North Tonawanda, N. Y.) died recently in Bloomfield, N. J.

Personnel

Thomas D. Darlington, director of the news bureau of Hercules Powder, resigned from that position, effective Feb. 6. He expects to devote considerable time to the study of international problems pertaining to the Pacific area.

Mr. Darlington is a graduate of Stanford University class of '25 and became associated with Hercules Powder in February, '28, as service salesman in the California district. He went to Wilmington in August, '28, as a member of the advertising department. Other positions held previous to his connection with Hercules were: U. S. Bureau of Reclamation, chief of party; editor, Burley, Idaho, Bulletin; reporter on San Francisco Bul-

Cellulose Plastic Products (Nitro Cellulose and Cellulose Acetate Sheets, Rods and Tubes)

December, 1933

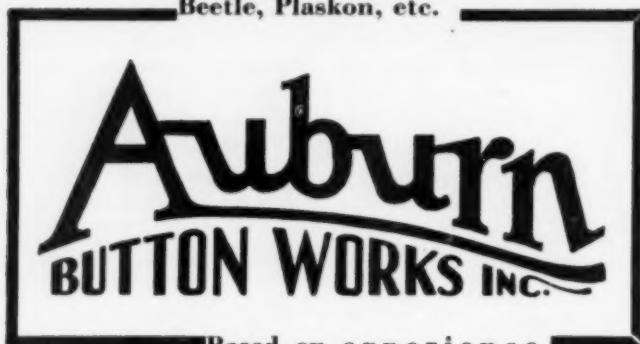
Compared with preceding months

Bureau of the Census presents, in the following table, monthly statistics on production and shipments of cellulose plastic products (sheets, rods, and tubes), based on data furnished by 8 identical establishments from January to July, inclusive, and by 10 establishments for August, September, October, November, and December. Comparable statistics, prior to January, 1933, segregated for nitro-cellulose and cellulose-acetate products, are not available. This report takes the place of the monthly report on "Pyroxylin Sheets, Rods, and Tubes."

Production and Shipments (Pounds)

Year & Mo.	Sheets		Nitro-Cellulose Rods		Tubes		Cellulose-Acetate Sheets, Rods, and Tubes	
	Production	Shipments	Production	Shipments	Production	Shipments	Production	Shipments
1933								
January.....	504,813	625,392	74,872	115,434	12,812	29,329	167,856	160,272
February.....	490,290	593,942	78,904	100,092	16,248	25,711	141,628	125,073
March.....	454,506	611,840	63,188	87,784	17,472	32,525	119,400	117,344
April.....	473,333	624,727	104,817	130,853	26,198	27,091	149,402	211,435
May.....	787,614	774,424	161,784	126,195	32,684	36,992	234,811	221,345
June.....	912,742	959,194	156,830	139,772	41,467	45,057	242,013	220,686
July.....	1,027,812	916,612	158,250	160,851	42,100	41,467	192,381	221,751
August.....	1,290,521	1,257,981	254,249	236,730	40,364	56,142	230,013	231,879
September.....	1,307,052	1,158,080	241,558	232,725	49,263	58,962	213,996	229,629
October.....	1,056,328	991,557	254,375	216,191	76,291	69,258	207,327	217,894
November.....	641,059	827,544	189,608	134,750	78,712	63,967	257,872	278,772
December....	562,152	944,821	163,317	183,471	72,328	92,673	325,412	352,362
Total (year)	9,508,222	10,286,114	1,901,812	1,864,848	506,039	579,174	2,482,111	2,588,442

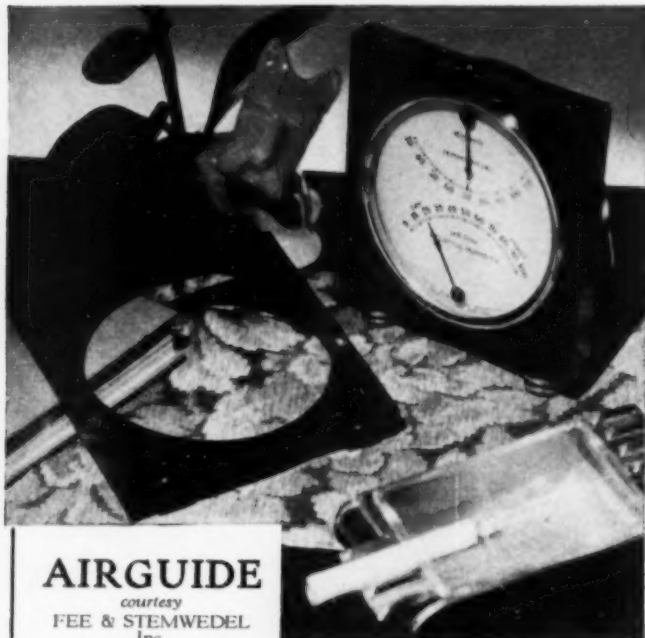
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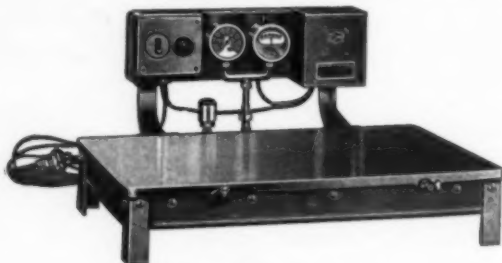
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letin; and with the Bureau of Management Research, San Francisco.

In his work with Hercules, Mr. Darlington was successful in widening the chemical industry's acquaintanceship with the diversified products which the company manufactured. These activities gained him many friends and wide recognition.

Stephen Babcock, formerly in charge of resin sales for John D. Lewis, Inc., is now with General Plastics as special representative handling oil soluble resins.

Edward J. Lewis, 9 S. Clinton st., Chicago, has been named by General Plastics as its representative for Chicago and surrounding territory on its oil soluble, 100% oil reactive resins. Mr. Lewis, a well-known figure in the Middle Western trade, has a substantial following among manufacturers, and the personnel of their plants.

S. W. Severance, former chief engineer in the plastics department of G. E., is now with Makalot Corp., (thermo plastic compounds) and is engaged in field engineering.

Westinghouse has just elected A. E. Allen as vice-president. He will have charge of the new merchandizing division.

Arthur Minich, chief chemist, Nuodex Products (driers), has been elected secretary.

Catalin Moves

American Catalin's executive offices, showroom, and warehouse are now located in spacious quarters at convenient One Park ave., N. Y. City, and the new telephone number is Ashland 4-2100. Company will carry in stock, in N. Y. City, for immediate shipment, a complete selection of finished Catalin in assorted colors, sizes and shapes. The sample fabricating room is now part of the office and samples can be made up for immediate inspection. Company has also installed an exhibit of all machines, tools and equipment which are particularly adapted to the fabrication of Catalin. A large well-appointed room has been set apart for the exclusive use of customers. The manufacturing facilities of the company have been enlarged considerably in the past 3 months to take care of the large increase in sales.

R. W. Lindsey, American Catalin's New England representative, has moved his offices from Hartford, Conn., to Providence. New address is 40 Lyndon Road, Edgewood—telephone Hopkins 1809.

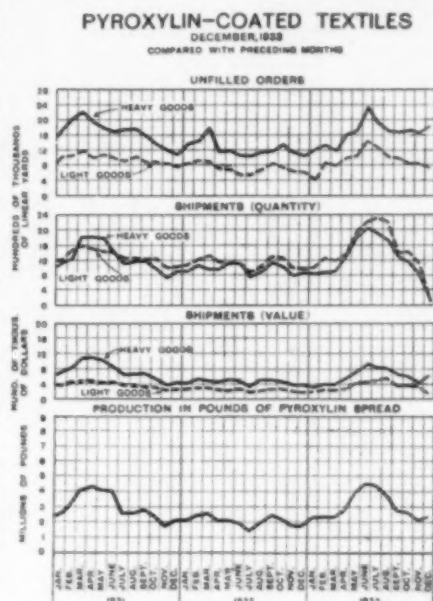
Philadelphia Sales

A. C. Erisman, Catalin representative in Philadelphia, reports sales to date so far this year equal to the total for 1931 and looks for an increase of at least 500%. "Philadelphia is keenly alive to the 'eye-appeal' of Catalin," states Mr Erisman.

Mar. '34: X, 3

Pyroxylin-Coated Textiles

(Following table presents monthly statistics relating to pyroxylin-coated textiles based on data reported to the Bureau of the Census by 19 identical



establishments comprising most of the industry. Data includes products manufactured by spreading nitrocellulose or pyroxylin preparations, either by themselves or in combination with other materials, upon grey goods, such as sheetings, drills, ducks, sateens, molleskins, etc.).

Item	1933	
	December	November
LIGHT GOODS:		
Shipments—		
Linear yards.....	1,071,274	1,174,674
Value.....	\$290,874	\$334,569
Unfilled orders (a)——		
Linear yards.....	791,533	810,674
HEAVY GOODS:		
Shipments—		
Linear yards.....	1,077,104	849,488
Value.....	\$605,929	\$476,056
Unfilled orders (a)——		
Linear yards.....	1,807,782	1,665,886
PYROXYLIN SPREAD (b):		
Pounds.....	2,350,880	2,156,663
MONTHLY CAPACITY (c):		
Linear yards.....	12,372,689	*12,372,689
(a) Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.		
(b) Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8 lb. jelly.		
(c) Based on a maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ ounces per linear yards, in a 24 hour working day, 26 days to a month.		
*Revised. Certain establishments discovered errors in capacity figures previously reported.		

Celluloid Has Net Profit

Celluloid and subsidiaries for year ended Dec. 31, '33, certified by independent auditors, shows net profit of \$143,986 after depreciation, taxes, etc., equivalent to \$6.03 a share on 23,882 no-par shares of \$7 cumulative first preferred participating stock, on which no dividends have been paid since Dec. 1, 1930. This compares with net loss of \$399,180 in '32. Current assets as of Dec. 31, '33, amounted to \$3,408,332 and current liabilities were \$139,459 compared with \$3,359,819 and

\$67,361, respectively, at end of preceding year. Cash, time deposits and marketable securities, at cost, totaled \$1,039,274 at close of '33, against \$1,110,176 on Dec. 31, 1932.

Sommer & Maca Glass Machinery Corp., 3608 S. Oakley ave., Chicago, has perfected equipment and tools for cutting, sealing and edging safety glass.

Book Reviews

Physical and Chemical Examination of Paints, Varnishes, Lacquers and Colors, by Dr. H. A. Gardner, 1,500 p., published by Institute of Paint and Varnish Research, 2201 New York ave., Washington, D. C. \$11.00.

Sixth edition is a thoroughly revised one, brought up to date to include all modern methods for physical and chemical testing of raw materials and finished products. A supplement gives the physical properties of over 1,000 paint pigments with the chemical composition given in many instances. There is a special supplement containing all specifications and test methods issued by the A.S.T.M. for protective coatings.

Handbook of Chemistry and Physics, 1818 p., by Charles D. Hodgman, published by Chemical Rubber Publishing Co., Cleveland, Ohio. \$6.00.

This standard work needs no introduction to the chemist and physicist. The 18th edition has several notable additions and changes, however, that make it much more valuable than its predecessors. Most important is the appearance of a new and wholly revised table of "Physical Constants of Inorganic Compounds." Nearly 1,500 compounds have been added. Section devoted to the elements has been entirely rewritten. Other equally important additions, too numerous for specific mention, have likewise been added.

The Inventor and His World, by H. Stafford Hatfield, 269 p., published by E. P. Dutton & Co., 300 4 ave., N. Y. City. \$2.40.

Inventors are mechanical geniuses who are doubly interesting because of their foibles and idiosyncrasies. The author, who is a scientist and an inventor, tells the story of invention from a practical and philosophic point of view. He indicates the characteristic temperament of the inventor, shows how he works, and he explains why it is so difficult for the inventor to get his invention adopted. Mechanical, chemical, electrical, biological, and psychological inventions are treated fully, and the book contains an invaluable chapter on the Patent Law in the U. S., Great Britain, and Germany. This work is valuable not only to show the inventor the best way to proceed, but to point out to the man who is interested in financing the invention, the best way to handle the inventor and the invention itself.

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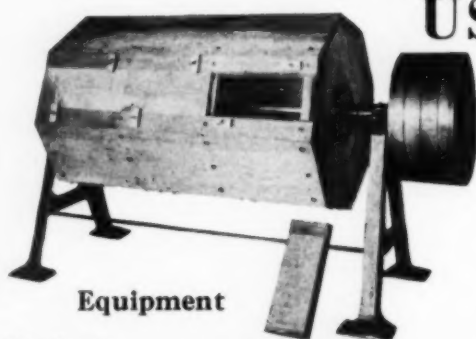
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The Chemical Formulary, by H. Bennett, 537 p., published by The Chemical Formulary Co., 950 3rd ave., Brooklyn, N. Y. \$6.00.

An up-to-the-minute collection of practical formulae for making thousands of products in all fields of industry. This book is not merely a revision, but an entirely new effort and, therefore, contains no obsolete or antiquated material that is so often found in similar books.

Micarta is extensively employed in the Westinghouse "Home of Tomorrow" which has just been completed at Mansfield, Ohio.

Hydraulic Press Elects

Hydraulic Press Manufacturing directors (manufacturers of hydraulic presses and equipment), elected Frank B. MacMillin as president and general manager of the Company, and Howard F. MacMil-

lin as vice-president and assistant general manager at their annual meeting held recently in Columbus. Walter G. Tucker, son of the founder of the Company was advanced from the presidency to chairman of the board. Frank B. MacMillin has been actively engaged in the management of the Company for 32 years, most of this time in the capacity of executive vice-president.

Casein was brought into the U. S. in larger quantities during '33 than in the preceding year, according to C. C. Concanon, Chief, Chemical Division, Bureau of Foreign and Domestic Commerce. General imports of casein in '33 were 6-fold those of '32 on a quantity basis and were invoiced at 12 times that year's value. According to preliminary data, arrivals in '33 totaled 8,141,598 lbs., valued at \$444,689, in comparison with 1,201,014 lbs., valued at \$38,466, in '32. On the other hand, U. S. production was light compared with previous years.

Principal supplier of foreign casein is Argentina, smaller amounts being received from France, Germany, Belgium, United Kingdom, Canada, British India and New Zealand. Shipments from Argentina in '33 aggregated 6,926,810 lbs. valued at \$348,456 compared with arrivals in '32 of 802,892 lbs. valued at \$13,703. Incoming shipments from France in '33 increased to 446,450 lbs. valued at \$36,101 from 76,717 lbs. with a value of \$4,761 in '32 while shipments from Germany totaled 635,082 lbs. valued at \$51,192 against 276,317 lbs. with a value of \$17,553 in the preceding year. Although imports from Argentina registered a high level in '33, Mr. Concanon said that this achievement was accomplished during the last half of the year when over 6,000,000 lbs. were imported from July to October, inclusive. Average invoice unit value of shipments received from Argentina in '33 was approximately 5c a lb. compared with less than 2c in '32.

Plastic Patents

Cellulose

Bonding with heat and pressure, using drying oil, vegetable fibers into a hard, strong product. No. 1,941,536. R. M. Boehm, to Masonite Corp., Miss.

Organic substitution derivative of cellulose and an acetylated tribrom-aniline. No. 1,941,664. A. J. Daly, England, to Celanese Corp.

Barium hydroxide under heat and pressure, digesting raw cellulosic material after dry distillation, to valuable products. No. 1,941,760. E. L. Rinman, Djursholm, Sweden.

Hard, rigid product from matter of high pentosan containing pento-cellulose materials, and molding of same. No. 1,941,817. O. R. Sweeny and C. E. Hartford, Iowa.

Process in cellulose derivatives, of removal of excess swelling agent, adding plasticizer, and molding under heat and pressure. No. 1,941,090. Arthur Eichengruen, Germany, to Celanese Corp.

Solid articles, cellulosic body impregnated with viscid polymerization product of an alkylene oxide. No. 1,942,146. L. Kollek and W. Engels, Germany, to I. G. F., Frankfurt.

Process for cellulose solutions of relatively high viscosity, using solvent in reaction vessel, oxygen absent. No. 1,942,346. E. Scheller, Lorbach, to Firma Roessler, Frankfurt.

Molds for metal casting, of celluloid solution mixed with acetone or butanol, the celluloid impregnating the mold sand. No. 1,942,583. Wm. H. Walter, Cynwyd, Pa.

Cellular fibrous material, for flexible sheet insulation. No. 1,942,733. G. D. Shaver, Kalamazoo, to Therminul Corp., Boston.

Cellulose organic ester composition containing dibutyl malate. No. 1,942,843. H. B. Smith, to Eastman Kodak.

Cellulose organic ester composition containing dibromo succinic acid. No. 1,942,844. H. B. Smith, to Eastman Kodak.

Method for leaching color from dyed cellulose derivative scrap. No. 1,942,848. E. R. Taylor & C. E. Allen, to Eastman Kodak.

Moistureproof igniting composition, using nitro-cellulose and a natural resin. No. 1,942,866. S. H. Ledin, Stockholm, Sweden.

Use of soluble acid phosphate of metal for fireproofing ligno-cellulose. No. 1,942,977. E. E. M. Payne, Narborough, England.

Device for spinning viscose solutions while applying long pre-

cipitating distances. No. 1,942,990. J. Voss, Wiesbaden, to Visking Corp., Chicago.

Cellulose solutions by dissolving in ammonium salt. No. 1,943,176. C. Graenecher, Basel, to Ste. of Chem. Ind., Switzerland.

Nitro-mixed fatty acid esters of cellulose. No. 1,943,231. D. R. Wiggam and J. S. Tinsley, to Hercules Powder, Del.

Molding viscose carrying titanate acid, for making opaque or turbid sheets, films, tubes, caps and bands. No. 1,943,346. W. Schwalbe & O. Schnecko, to Kalle & Co., Wiesbaden, Germany.

Foodstuff for peristaltic action, of water-resistant organic derivative of cellulose. No. 1,943,374. Camille Dreyfus, N. Y.

For the reduction of viscosity of a cellulose ether. No. 1,943,461. D. Traill and A. S. Levesley, to Imp. Chem. Ind., England.

Composition, cellulose derivative and ester of an aryloxy-ethoxyethanol. No. 1,943,972. E. F. Izard, Elsmere, to duPont & Co., Wilmington.

Metal foil wrapping with coating layers of highly pliable and tensile cellulose derivative. No. 1,944,323. K. Kilchling, Freiburg, Germany.

Solid, regenerated cellulose coated by linseed products, for insulating material. No. 1,944,562. A. Kronstein, to Electra-Lackwerke, Karlsruhe, Germany.

Light obstructive cellulosic sheets, sprayed in particles on smooth surface, cemented and laminated in plurality into films. No. 1,942,840. S. E. Sheppard & L. W. Eberlin, to Eastman Kodak.

Coatings

Hydrogenated phthalid in polyhydric alcohol and polybasic acid, as plasticized coating composition. No. 1,941,474. A. O. Jaeger, to Selden Co., Pittsburgh.

Coating, of phenol furfural resin, phenol aldehyde resin, and common solvent. No. 1,941,708. W. H. Moss and Blanche B. White, to Celanese Corp.

Method of coating and product thereof. No. 1,941,709. W. H. Moss, to Celanese Corp.

Composition containing cellulose acetate and a dihydroxy benzophenone. No. 1,941,710. W. H. Moss, to Celanese Corp.

Varnish composition of Batu gum, rosin, lime, and China-

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 loid scrap, including
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wood oil. No. 1,942,413. J. B. Dietz and E. F. Oeffinger, to duPont & Co., Wilmington.

Method for cellulose lacquer with pigment. No. 1,942,591. W. G. Randolph, to The Egyptian Lacquer Mfg. Co., N. Y.

Oil-soluble resin and volatile solvent coating composition. No. 1,942,736. W. F. Whitescarver & H. H. Hopkins, to duPont & Co., Wilmington.

Cellulose ester lacquer with carnauba wax. No. 1,942,902. L. Roon, to Roxalin Flexible Lacquer Co., Long Is. City, N. Y.

Coating containing nitrocellulose and chlorinated diphenyl. No. 1,942,926. R. L. Jenkins, to Swann Research, Inc., Ala.

Use of lacquer coating and of impregnating solution having char-preventing and lacquer plasticizing properties, in making shell tubes. No. 1,943,501. W. H. Woodford, to Remington Arms, Bridgeport.

Coating compound; acid and basic coal tar dyes, with hyssop, gelatin and pancreatin. No. 1,943,926. Mary B. Parrish, Phila.

"Loxal" trade-mark, for compositions to treat metal surfaces to generate protection for reception of coatings. No. 344,139. Curtis-Howe Corp., N. Y.

Treatment of oils high in free acids with inorganic zinc compounds, in making paints, coatings, enamels. No. 1,944,813. F. Schmid, Oberhausen, Ger.

Resinous coating composition; oxidizable polyhydric alcohol-polybasic acid resin and petroleum hydrocarbon solvent. No. 1,942,757. J. W. Iliff & R. H. Young, to duPont & Co., Wilmington.

Laminated

Silent gear and method of manufacture. No. 1,943,024. R. W. Lytle, to Formica Insulation Co., Cincin.

Surface sheet with phenol-aldehyde filler, others impregnated with different resin composition, to form laminated product. No. 1,944,143. H. L. Bender, to Bakelite Corp., N. Y.

Laminated fibrous composite panel, welded by heat and pressure. No. 1,942,723. T. B. Munroe & E. C. Lathrop, to Celotex Co., Chicago.

Machinery

Machine for producing laminated glass, in series of ovens and press plates. No. 1,944,277. A. C. Schoepfer, Flint, Mich.

Process for treating cold-moldable plastic material for insulating articles, extruding the mixture, dividing and cold molding the blanks. No. 1,944,464. L. T. Richardson, to Cutler-Hammer, Inc., Milwaukee.

Hydraulic molding press with slidably mounted guide piston and separate pressure piston. No. 1,944,728. E. Brockel, to Maschinenfabrik Aug/Nurnberg, Augsburg, Ger.

Miscellaneous

Collapsible tube with projections to hold cap. No. 1,942,942. W. F. Schmalz, to Colt's Pat. Fire Arms Co., Hartford.

Fountain pen with transparent tubular barrel. No. 1,943,048. Joseph Wallace, Brooklyn, N. Y.

Molded button with metal attaching fixture embedded. No. 1,943,063. P. E. Fenton, Thomaston, to Seovil Mfg. Co., Waterbury.

Molded decorative article, plastic composition base and anodic aluminum colorant. No. 1,943,131. L. O. Marsyeller, to Westinghouse Mfg. Co.

To make composition roofing—felt and starch solution, with bituminous waterproofing material. No. 1,943,257. N. P. Harshberger, Pasadena, to Bakelite Building Prod. Co., N. Y.

Roofing and siding materials, impregnated fibrous structures, given heat and pressure. No. 1,943,258. N. P. Harshberger, Scarsdale, to Bakelite Building Prod. Co., N. Y.

Molded dielectric condenser with composite armature plates. No. 1,943,715. W. R. Bailey, Lynn, to Gen. Elec. Co., N. Y.

Improvement in manner of hydrocarbon flame on metallic

depository, in manufacture of carbon black. No. 1,944,715. G. C. Lewis, to Columbia Carbon, N. Y.

Fluid meter part, molded from phenolic resinoid and filler of divided mica and asbestos. No. 1,942,874. C. A. Nash, to Bakelite Corp., N. Y.

Composition from high temperature, of casein, glycerine, rubber, ethanolamine, cork and plasticized glue. No. 1,941,437. H. H. Jordan, to Armstrong Cork Co., Lancaster, Pa.

Molding composition of high bulk density and low moisture content, using an artificial resin. No. 1,941,059. A. R. Steele & A. Stewart, to Imperial Chem. Ind., England.

Polymerizing oil from *sterculia foetida*, at 100°-650° heat, discontinuing at stage to form a composition of matter. No. 1,939,773. M. T. Harvey, East Orange, N. J., to The Harvel Corp.

Phenol

For the manufacture of non-dyeing metalliferous sulphurized phenol derivatives. No. 1,943,179. V. Kartaschoff & O. Knecht, to Chemical Works Sandoz, Basel, Sw.

"Pentaphen" trade-mark, for phenolic compositions. No. 336,839. The Sharples Solvents Corp., Phila.

Phenol solvent and superpressure treatment for removal of pure phenols from tars or tar oils. No. 1,934,861. J. Karpati & M. G. Hubsch, Budapest, Hungary.

Purification process for phenolphthalein carrying resinous impurities. No. 1,940,146. H. P. Roberts, to Kavalco Products, Inc., Nitro, W. Va.

Resins

In production of resins from oils with organic polymerizable constituents, the step of treatment with litharge. No. 1,942,201. E. L. Cline, to The Barrett Co., N. Y.

Process and apparatus for cooling and granulating resin. No. 1,942,764. S. P. Miller, Englewood, to The Barrett Co., N. Y.

Resinous products which are permanently fusible and soluble in vegetable drying oil; phenol-aldehyde condensation. No. 1,944,016. Fritz Seebach, Berlin, to Bakelite Gess. m.b. Haftung, Haftung, Berlin-Charlottenburg.

Resin solution; thiourea-formaldehyde permanently fusible resin dissolved with hardening agent. No. 1,944,867. J. H. Schmidt & R. S. Daniels, to Bakelite Corp., N. Y.

Basic salt of aroyl-benzoic acids, a resinous mass soluble in toluene. No. 1,939,621. H. A. Burson, to Resinous Products & Chem. Co., Phila.

Infusible synthetic resins, aniline with strong mineral acid and formaldehyde. No. 1,939,691. P. Haller & H. Kappeler, Basel, to Ciba Prod. Co., Dover, Del.

Hard, light amber resin, from hydrocarbons. No. 1,939,932. C. A. Thomas, to Dayton Syn. Chemicals, Inc., Dayton, O.

Resinous compounds from phosphorous amide an and aldehyde and from phosphorous chloride, ammonia and an aldehyde. No. 1,940,383. W. H. Woodstock, to Victor Chem. Works, Chicago.

Allyl alcohol-cresol with zinc chloride catalyst, as resin and coating or plastic composition. No. 1,940,727. W. H. Moss & G. W. Seymour, to Celanese Corp., of America, Del.

Vinyl

Heat-pressure product from solution of vinyl esters and styrene with a peroxide catalyst, and one of a group of vinyl esters and styrene in presence of rosin. No. 1,942,531. H. J. Barrett, to duPont Co., Wilmington.

Process for producing compounds of polymerized vinyl esters and fatty oils. No. 1,934,297. Eibner, Herrmann, Haehnel and Miller, to Cons. fur Elektrochemische Industrie, Bavaria.

Production of vinyl ethers, treating certain vinyl halides with an alcoholate and a diluent. No. 1,941,108. Walter Reppe, to I. G. F., Frankfurt.

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(1) 1 set 16" x 36" mixing rolls with 150 HP. G. E. motor and compensator and link belt drive. (2) 9 hydraulic presses, Watson Stillman type platens 13" x 18", 2 1/2" ram, 3 1/2" stroke. (3) 5 William Thropp hydraulic presses, platen 15" x 15", 8" ram, 5" stroke. (4) 34 Standard type toggle presses, platens 13 1/4" x 14 1/4". (5) 18 steam tables 24" x 42", 15 steam tables 18" x 30". (6) 1-50 ton Terkelson press; 2-100 ton Terkelson press (Satest type). (7) 1 Meade Grinder. (8) 1 Jeffrey Grinder. (9) 1 Southwark High pressure Vertical Triplex Pump with 5 H. P. integral motor drive.

THE WATERBURY BUTTON COMPANY
Waterbury, Connecticut.

Classified Advertising

Rates for classified advertising, per issue, are \$1.00 for 20 words or less; 5c for each additional word. 10c for forwarding mail if box number is used. Payment must be enclosed with order, which must be received by publishers no later than the 20th of preceding month.

AVAILABLE: Chemical Engineer possessing good knowledge and eight years experience, hot and cold molding desires an executive connection with an energetic well equipped organization. Production or Development preferred. Address, Box 627 Plastic Products.

WANTED: Experienced man to introduce laminated decorated phenol fibre sheets to architectural field. Address Taylor & Company, Norristown, Pa.

AVAILABLE: Chemical Engineer with following experience: Brake Linings—one year; Cold Molded Insulating Materials—two years; Asbestos Paper and Millboard. Address Box 626, Plastic Products.

ANNOUNCEMENT: Mr. Maurice Salle of the Societe Francaise de l'Amiante, Fiers de l'orne, France—and also owner of the Fletex Co., France—Manufacturers of brake linings and clutch facings—will be in New York some time in March. He will be accompanied by the General Manager of the Fletex Co., Mr. Charles A. Viriot well known in the United States for his connections with the Silentbloc.

Mr. M. Salle is in the market for automobile products capable of a very wide distribution. Any automotive product will be considered, provided it presents large selling possibilities. The Fletex Co. have the biggest distribution service in France, and their selling forces would be unique for such a product.

Mr. M. Salle will be residing in New York at the St. Regis where correspondence to him is to be addressed—a copy of same should be forwarded care of his shippers Messrs. J. E. Bernard & Co., 27 Pearl Street, New York.

FOR SALE: Complete Translation, Mienes-Frank, "Technology of Cellulose Derivatives" (Monograph, Verein Deutscher Chemiker, 1933); mimeographed, 33 pp., \$1.25. Irene F. Smith, 1408 Riverview Ave., Wilmington, Del.

FOR SALE: Two large hydraulic presses with two rams each, platens 8' x 3' fitted with push backs, high and low pressure pump for same, this outfit ideal for veneering work. Also complete hobbing outfit, 600 ton press, pump and motor all as good as new. Also twenty-five small hydraulic moulding presses. INSULATION MFG. CO. INC., 11 NEW YORK AVENUE, BROOKLYN, N. Y.

CANADA—Well known and established Manufacturers' Agent, with first class connection, wants one or two high grade lines to sell to manufacturers or jobbers. Correspondence invited. L. C. Feldstein, 208 King Street West, Toronto, Canada.